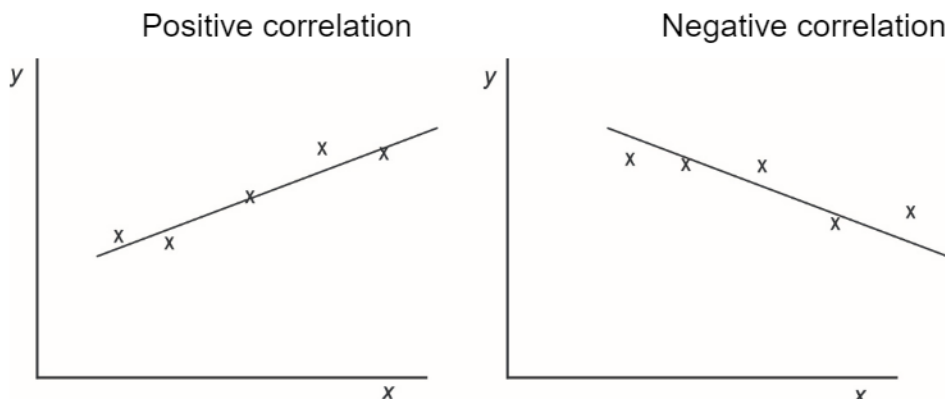


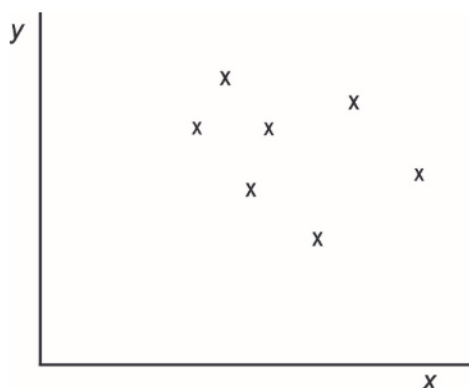
Partial correlation



In the first diagram there is not an exact relationship, but low values of x tend to be associated with low values of y , and high values of x tend to be associated with high values of y .

In the second diagram again there is not an exact relationship, but low values of x tend to be associated with high values of y and vice versa.

No correlation



The values of the two variables seem to be completely unconnected.

Positive and negative correlation

Correlation can be positive or negative.

Positive correlation means that high values of one variable are associated with high values of the other and that low values of one are associated with low values of the other.

Negative correlation means that low values of one variable are associated with high values of the other and vice versa.

The correlation coefficient

The degree of correlation can be measured by the Pearsonian correlation coefficient, r (also known as the product moment correlation coefficient).

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Note: This formula is provided in the formula sheet for this exam.

The calculation of correlation coefficients can be useful in telling us how strongly two sets of data are related to each other – for instance, factory costs relation to production levels or sales volumes in relation to advertising spend – so that we can decide whether the data can be used to help us forecast.

r must always be between -1 and $+1$.

If $r = 1$, there is perfect positive correlation. The data points lie exactly on a straight line of positive gradient.

If $r = 0$, there is no linear correlation.

If $r = -1$, there is perfect negative correlation (again the data points lie on a straight line, but with a negative gradient).

For other values of r , the meaning is not so clear. It is generally taken that if $r > 0.8$, then there is strong positive correlation and if $r < -0.8$, there is strong negative correlation.

However, more meaningful information can be gathered from calculating the coefficient of determination, r^2 (see next page).

**Test your understanding 12 – A Co**

A Co is assessing the impact of advertising on customer perceived quality of its products.

If the correlation coefficient between variables X (advertising spend) and Y (customer perceived quality) is 0.85, which TWO of the following comments are correct?

- A Values of Y increase as values of X increase
- B Y decreases by 0.15 for every increase of 1 in X
- C Y increases by 0.85 for every increase of 1 in X
- D The link between X and Y values is very strong
- E The link between X and Y values is linear
- F Increases in X cause corresponding increases in Y

The coefficient of determination

This measures how good the estimated regression equation is, designated as r^2 (read as r-squared). The higher the r-squared, the more confidence one can have in the equation. Statistically, **the coefficient of determination represents the proportion of the total variation in the y variable that is explained by the regression equation**. It has the range of values between 0 and 1.

For example, if we read the following statement "factory overhead is a function of machine-hours with $r^2 = 0.80$," can be interpreted as "80% of the total variation of factory overhead is explained by the machine hours and the remaining 20% is accounted for by something other than machine-hours." The 20% is referred to as the **error term**.



Test your understanding 13 – Coefficient of determination

The correlation coefficient (r) for measuring the connection between two variables (x and y) has been calculated as 0.6.

How much of the variation in the dependent variable (y) is explained by the variation in the independent variable (x)?

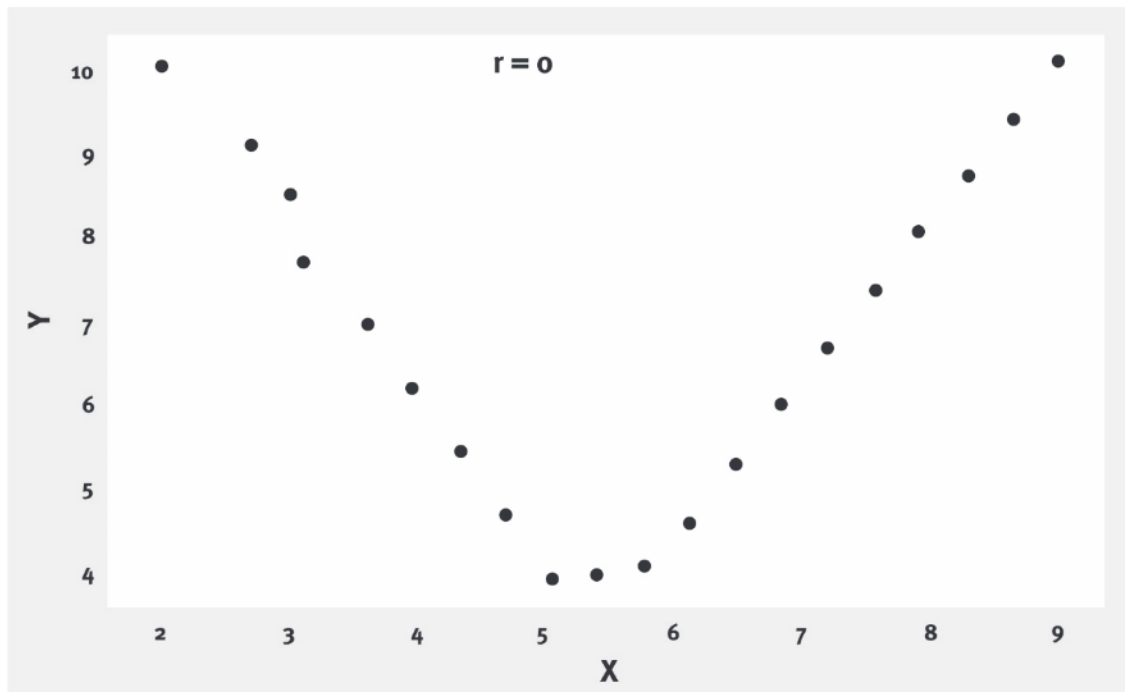
- A 36%
- B 40%
- C 60%
- D 64%

Limitations of correlation

- (1) Correlation could be **misleading** used on sample data. Because an apparent correlation in a sample is not necessarily present in the population from which the sample came from. It could be only due to chance coincidence – a random sampling error. This is why a correlation must be accompanied by a significance test to assess its reliability.
- (2) Correlation and **causality** are not the same thing. Although a correlation demonstrates that a relationship exists between two variables, it does not automatically imply that one causes the other. Just because X and Y are correlated in some way does not mean that X causes a change in Y , or vice versa.

For instance, if we look at two variables, 'sales of sunglasses' and 'ice cream sales', we know intuitively that there's no way one variable has a cause-and-effect impact on the other. However, both sunglasses sales and ice cream sales will have greater numbers in summer months, so they will be strongly correlated with each other.

- (3) A correlation coefficient of '0' could fail to detect an obvious relationship if it is **not a linear one**. For example, the correlation coefficient is also 0 in this case:



The correlation coefficient will only detect linear relationships. Just because the correlation coefficient is near 0, it doesn't mean that there isn't some type of relationship there.

Time series analysis

Using time series analysis in order to forecast future figures in a budget is a favourite examination topic in the Management Accounting (MA) exam.

In this Performance Management (PM) exam, candidates must be able not only to use the time series techniques to forecast future trends and seasonal variations, but also understand the weaknesses of time series analysis and the problems of using historical data to predict the future.

Time series forecasting methods are based on analysis of historical data. They make the assumption that past patterns in data, such as seasonality, can be used to forecast future data points. This means that its future predictions are more curved than linear.



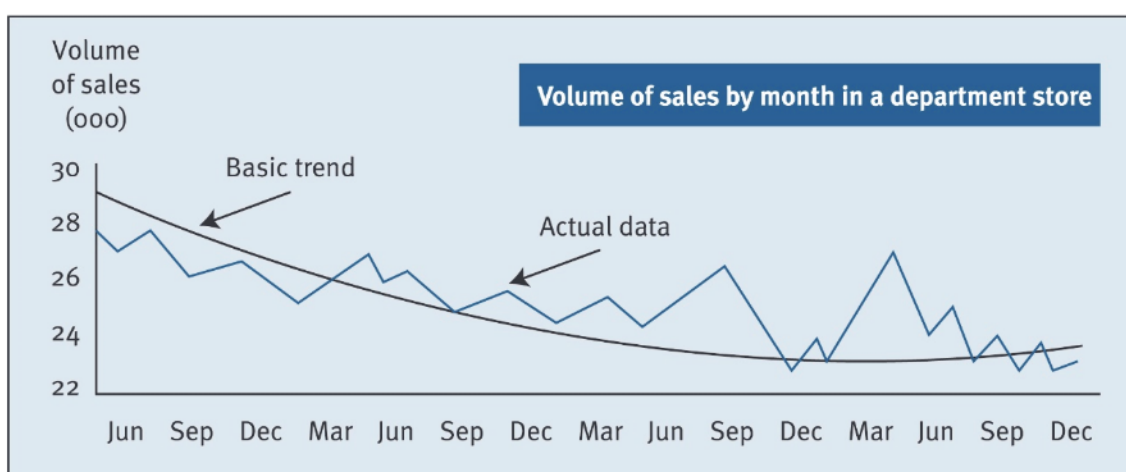
Definition

A time series is a set of values for some variable (e.g. monthly production) which varies with time. The set of observations will be taken at specific times, usually at regular intervals. Examples of figures which can be plotted as a time series are:

- monthly rainfall in London
- daily closing price of a share on the Stock Exchange
- monthly sales in a department store.

Time series analysis takes historic data and breaks it down into component parts that are easier to extrapolate (predict future values of). In particular, it will isolate the underlying trend.

The basic pattern of a time series can be identified by plotting the recent points of the values on a graph:



Characteristic time series components

Analysis of time series has revealed certain characteristic movements or variations: the components of the time series. Analysis of these components is essential for forecasting purposes.

The four main types of component are as follows:

- The **basic trend** (long-term): The basic trend refers to the general direction of the graph of a time series over a long interval of time once the short-term variations have been smoothed out. This movement can be represented on the graph by a basic trend curve or line.
- **Cyclical variations** (medium-term): Cyclical variations refer to medium-term oscillations or swings about the basic trend. These cycles may or may not be periodic; they do not necessarily follow exactly similar patterns after equal intervals of time. In business and economic situations movements are said to be cyclical if they recur after time intervals of more than one year. A good example is the trade cycle, representing intervals of boom, decline, recession, and recovery.

- **Random variations** (short-term): Random variations are the sporadic motions of time series due to chance events such as pandemics, floods, strikes, elections, etc. By their very nature, they are unpredictable and therefore cannot play a large part in any forecasting, but it is possible to isolate the random variations by calculating all other types of variation and removing them from the time series data. It is important to extract any significant random variations from the data before using them for forecasting.

- **Seasonal variations** (short-term):

Seasonal variations are the identical, or almost identical, patterns which a time series follows during corresponding intervals of successive periods. Such movements are due to recurring events such as the sudden increase in department store sales before Christmas. Although, in general, seasonal movements refer to a period of one year, this is not always the case and periods of hours, days, weeks, months, etc. may also be considered, depending on the type of data available.

Having isolated the trend we need to consider how to deal with the seasonal variations. We will look at two models – the additive model and the multiplicative model.

The additive model is the simplest model and is satisfactory when the variations around the trend are within a constant band width. If, as is more usual, the variations around the trend increase as the trend itself rises, it is better to use the multiplicative model.

The additive model – finding the seasonal variations

The additive model we will use expresses variations in absolute terms with above and below average figures being shown as positive or negative.

The four components of a time series (T = trend; S = seasonal variation; C = cyclical variation; R = random variation) are expressed as absolute values which are simply added together to produce the actual figures:

$$\text{Actual data (time series)} = T + S + C + R$$

For unsophisticated analyses over a relatively short period of time cyclical variations (C) and random variations (R) are ignored. Random variations are ignored because they are unpredictable and would not normally exhibit any repetitive pattern, whereas cyclical variations (long-term oscillations) are ignored because their effect is negligible over short periods of time. The model therefore simplifies to:

$$\text{Actual data} = T + S$$

The seasonal variation is therefore the difference between the computed trend figure and the original time series figure. Thus:

$$S = \text{Actual} - T$$



Illustration 4 – The additive model

The seasonal variations can be extracted by subtracting each trend value (using the moving averages method) from its corresponding time series value.

Quarter	Original time series (sales, \$000)	Underlying trend	Seasonal variation (\$)
	(a)	(b)	(a) – (b)
3	94	100	(6)
4	127	102	25
1	84	106	(22)
2	106	111	(5)



Test your understanding 14 – Eastoft Feeds and Fertilisers

Eastoft Feeds and Fertilisers Co uses a number of standard raw materials for its product range. Product F4's main raw material is 'EF1'. The average price per tonne for this material, which is subject to seasonal change, for each quarter during 20X5 is given below. The material is in short supply.

20X5	Q1	Q2	Q3	Q4
Average price per tonne	\$40	\$44	\$64	\$76
Seasonal variation	–\$4	–\$8	+\$4	+\$8

Use the following table to determine the underlying trend in the average price of raw material 'EF1'.

20X5	Q1	Q2	Q3	Q4
Average price per tonne				
Seasonal variation				
Trend				

Assuming a similar pattern of price movements was to continue, complete the following table to determine the likely purchase price per tonne for each of the 4 quarters of 20X6.

20X6	Q1	Q2	Q3	Q4
Trend (increase of \$8 per quarter)				
Seasonal variation				
Forecast price per tonne				

Seasonal variations and the multiplicative model

Some exam questions may give the trend figures and seasonal variations but, instead of the seasonal variations being given in absolute figures as in the additive model that we have used so far, the seasonal variations may be given as percentage figures. This is the case if the **multiplicative model** is used for the time series analysis.

In order to find the forecast figures in this case, simply multiply the trend figure by the seasonal variation percentage and either add it to the trend or deduct it from the trend.



Illustration 5 – The multiplicative model

Given below are the estimated trend figures for a company's sales for the next four quarters:

20X3	Trend
	\$
Quarter 1	560,000
Quarter 2	580,000
Quarter 3	605,000
Quarter 4	632,000

The seasonal variations using the multiplicative model have been calculated as:

Quarter 1	+ 15%
Quarter 2	+ 10%
Quarter 3	– 5%
Quarter 4	– 20%

Calculate the forecast sales figures for each of the next four quarters.

Solution

Quarter 1	$\$560,000 + (\$560,000 \times 0.15) =$	\$644,000
Quarter 2	$\$580,000 + (\$580,000 \times 0.10) =$	\$638,000
Quarter 3	$\$605,000 - (\$605,000 \times 0.05) =$	\$574,750
Quarter 4	$\$632,000 - (\$632,000 \times 0.20) =$	\$505,600

Note: in some questions, these same seasonal variations may have been given as 1.15, 1.10, 0.95 and 0.80.

Forecast sales would then be determined as:

Quarter 1	$\$560,000 \times 1.15 =$	\$644,000
Quarter 2	$\$580,000 \times 1.10 =$	\$638,000
Quarter 3	$\$605,000 \times 0.95 =$	\$574,750
Quarter 4	$\$632,000 \times 0.80 =$	\$505,600



Test your understanding 15 – IST Co

In IST Co, this year sales amount to \$1,325,000. Analysis of recent years show a growth trend of 2% per annum. The seasonal variation has been estimated as follows:

- Quarter 1 +\$12,000
- Quarter 2 +\$18,000
- Quarter 3 –\$25,000
- Quarter 4 –\$5,000

You have been asked to forecast the sales for each quarter of next year:

Quarter	\$
1	
2	
3	
4	
Year	

Advantages and disadvantages of time series analysis

Advantages	Disadvantages
• Identifies seasonal variations	• Complicated
• Can be non-linear	• 'Seasons' may change
• Accurate	• Based on historical data
	• Less useful on the long term

There are a number of problems with using time series analysis in order to estimate or forecast future results.

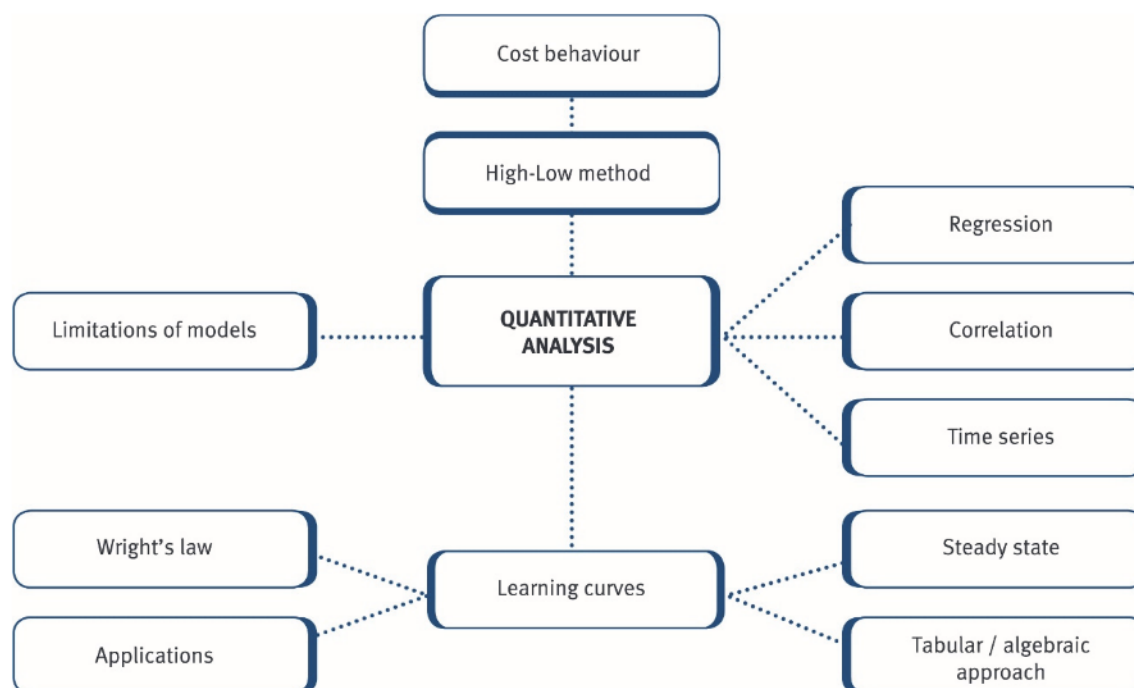
- The main problem is the inherent weakness of extrapolation. In order to estimate the trend for the future, the trend line is extended on the graph and the figures read off. However, although the time series has moved in that particular manner in the past, it does not necessarily mean that it will continue to do so in the future.
- The seasonal adjustments used to find the forecast for the future are also based upon historic figures that may well already be out of date. There is no guarantee that the seasonal variations will remain the same in the future. If the time series has a large residual or random variation element, then this will make any forecasts even less reliable.

Conclusions on quantitative techniques

Different forecasting techniques have been explored here (and there are many more in the real world). **Linear regression** is most relevant when there is a linear relationship between the variables, **time series analysis** is most appropriate when seasonal variations causes curved forecasts.

The reliability of a forecasting method can be established over time. If forecasts turn out to be inaccurate, management might decide that they are not worth producing, and that different methods of forecasting should be tried. On the other hand, if forecasts prove to be reasonably accurate, management are likely to continue with the same forecasting method.

8 Chapter summary



Test your understanding answers



Test your understanding 1 – High Low analysis

Step 1: Select the highest and lowest activity levels and their costs

Six months to 31/12/X8	Units produced	Inspection costs
		\$
Highest month	420	2,400
Lowest month	300	2,160
Range	120	240

Step 2: Find the variable cost per unit

Variable cost per unit = $\$240/120 = \$2$ per unit

Step 3: Find the fixed cost

Fixed inspection costs are, therefore:

$\$2,400 - (420 \text{ units} \times \$2) = \$1,560$ per month

or $\$2,160 - (300 \text{ units} \times \$2) = \$1,560$ per month

i.e. the relationship is of the form $y = \$1,560 + \$2x$.

Step 4: Use these costs to forecast the total costs for 500 units

Total cost = fixed cost + variable cost

Total cost = $\$1,560 + (\$2 \times 500)$

Total cost = $\$2,560$



Test your understanding 2 – Learning Curve table

Cumulative			Incremental		
Units	Average time p.u.	Total time	Units	Total time	Average time p.u.
1	100	100	1	100	100
2	80	160	1	60	60
4	64	256	2	96	48
8	51.2	409.6	4	153.6	38.4
16	40.96	655.36	8	245.76	30.72



Test your understanding 3 – Learning curve calculations

(a)

$$\begin{aligned}
 a &= 100 \\
 b &= \log 0.8 / \log 2 = -0.3219 \\
 x &= 16 \\
 y &= 100 \times 16^{-0.3219} \\
 &= 40.96 \text{ hours}
 \end{aligned}$$

(b)

$$\begin{aligned}
 x &= 25 \\
 y &= 100 \times 25^{-0.3219} \\
 &= 35.48 \text{ hours}
 \end{aligned}$$

(c)

$$\begin{aligned}
 x &= 20 \\
 y &= 100 \times 20^{-0.3219} \\
 &= 38.12 \text{ hours} \\
 \text{Total time for 20 units} &= 38.12 \times 20 \\
 &= 762.40 \\
 x &= 19 \\
 y &= 100 \times 19^{-0.3219} \\
 &= 38.76 \text{ hours} \\
 \text{Total time for 19 units} &= 38.76 \times 19 \\
 &= 736.44 \\
 \text{Time for 20}^{\text{th}} \text{ unit} &= 762.40 - 736.44 \\
 &= \mathbf{25.96 \text{ hours}}
 \end{aligned}$$



Test your understanding 4 – Cessation of the learning curve effect

Step 1: Calculate the cumulative average time for the number of units/batches at which the learning effect ceases.

$$b = \log 0.9 / \log 2 = -0.152003$$

$$y = ax^b$$

Cumulative average time for 72 batches, y is:

$$y = 20 \times 72^{-0.152003} = 10.44 \text{ hrs/batch}$$

Step 2: Calculate the cumulative average time for the number of units/batches, at which the learning effect ceases, minus 1

$$x = 71 \text{ batches}$$

$$y = 20 \times 71^{-0.152003} = 10.46 \text{ hrs/batch}$$

Step 3: Calculate the time taken to make the unit/ batch at which the learning effect ceases.

Batches	1–71 will take $71 \times 10.46 =$	742.66 hrs
Batches	1–72 will take $72 \times 10.44 =$	751.68 hrs
Batch	72 will take	9.02 hrs

Step 4: Calculate the total time for the number of units/batches

Batches	1–72 will take	751.68 hrs
Batches	73–100 will take $28 \times 9.02 =$	252.56 hrs
Batches	1–100 will take	1,004.24 hrs



Test your understanding 5 – Product X

Using Wright's Law, each time the cumulative output doubles, the cumulative average time per unit will go down by the learning rate.

To get from 1 to 8 the total has doubled 3 times, we need to apply a factor of $\times r^3$ to the average time:

$$20 \text{ minutes} \times r^3 = 12.72 \text{ minutes}$$

$$r^3 = (12.72)/20 = 0.636 \text{ so}$$

$$r = 0.6361^{(1/3)} = 0.86 \text{ or } \mathbf{86\%}$$



Test your understanding 6 – SCW Co

(a) Actual learning rate achieved

Given we have figures for cumulative output of 1 and 8 units, we can use total doubling (3 times):

Cumulative average time to make 1 unit = 40 minutes

Cumulative average time to make 8 units = $233/8 = 29.125$ minutes

The learning rate, r , can be calculate using $Y = ar^n$

$$29.125 = 40 \times r^3$$

$$r^3 = 29.125/40 = 0.728125$$

$$r = 0.8996, \text{ or } 90\%$$

- (b) The reasons for the quicker learning could include the following:
- The process for product Q was more familiar than expected, perhaps because the product was more like existing products than thought.
- The workers used were more experienced or higher skilled than would be the case for normal production, so were able to resolve the complexities of the new task more quickly.



Test your understanding 7 – Calculate the learning rate

Answer D

The total time for 1 batch is 100 minutes, the total time for the first 2 batches is $100 + 70 = 170$ minutes

The average time per batch would be 1 batch = 100 mins and 2 batches = $170/2 = 85$ minutes

Using Wright's law, the learning rate = $85/100 = 0.85$ or 85%



Test your understanding 8 – Learning curve statement

- (a) The 'cumulative average time' model commonly used to represent the learning curve effects is demonstrated below for a 70 per cent learning curve:

Number of units produced	Cumulative average time required per unit	Total time required	Incremental time required for additional units
1	100	100	0
2	70	140	40
4	49	196	56
8	34.3	274.4	78.4

In this model, the cumulative average time required to produce a unit of production is reduced by a constant proportion of the previous cumulative average time, every time the cumulative output doubles.

In the above example, unit 1 requires 100 hours, but units 1 and 2 require only 140 hours, unit 2 being produced in 40 hours due to labour having learned how to perform more efficiently. Units 3 and 4 require only a further 56 hours' work, etc.

This may be modelled mathematically by the equation

$$Y = a x^b$$

where Y = cumulative average hours per unit, x = cumulative demand, and a and b are constants. This is only one of the several models that may be used to predict the relationship between output and labour requirements.

- (b) Budgeting, budgetary control and project evaluation all rely upon the preparation of accurate forecasts of production capacity and operating costs. Learning curve theory may be used in such forecasts.

In particular, the learning curve theory may be used when repetitive manual tasks are introduced into a production process. Under these circumstances, application of this theory may result in more accurate prediction of labour time, labour costs, variable overhead costs that are driven by labour usage, and possibly material usage savings. Furthermore, if absorption costing is used, then this theory will enable the relationship between fixed overhead recovery and production rate to be accurately included in the budgeting process.

For budgetary control to be effective, the variances calculated must be based on realistic targets. A constant standard for labour, materials and variable overhead variances is not appropriate when the learning curve effect is present. By incorporating the learning curve theory into the targets, meaningful variances may be calculated and used in budgetary control.

Problems may be experienced in obtaining data on the rate of the learning curve until significant production has taken place. High labour turnover and changes in motivation levels may have significant effects upon the learning process. If there are extensive periods of time between batches of a particular product then the learning effect may be lost. The learning curve does not model long-term behaviour when there are no further productivity gains due to the learning process.

- (c) The learning curve models the speeding up of a relatively new production process that involves repetitive manual operations due to labour learning from the experience. It was first documented in WWII in the aircraft industry in the United States.

It is unlikely to be noticeable in well-established organisations that operate in static markets (growth, technology, etc.) and use standardised production facilities and mainly promotional marketing strategies.



Test your understanding 9 – Swiss watch

(a) Initial order

	\$
Material (10 × \$30)	300
Labour and variable overhead (100 × \$3)	300
Setting-up cost (see note)	1,000
Total	\$1,600
Minimum price each (\$1,600 ÷ 10)	\$160

Note: If there is no guarantee of a follow-up order, the setup costs must be recovered on the initial order.

(b) Follow-on order

- $b = \log 0.8 / \log 2 = -0.321928$
- If production increases to 20 watches (2 batches) then the cumulative average time per batch is:
 $y = ax^b$
 $y = 100 \times 2^{-0.321928}$
 $y = 80.00$ hours
- i.e. cumulative time for 20 watches (2 batches) = 160 hours
- Therefore, the time taken for the second batch of ten watches = 160 – 100 = 60 hours.

Costs are therefore:

	\$
Material (10 × \$30)	300
Labour and variable overhead (60 × \$3)	180
Total	480
Minimum price each	48

Note: The set up costs have been recovered on the initial order and can therefore be ignored.

(c) Both orders together

Total costs are:

	\$
Material (20 × \$30)	600
Labour (160 hours × \$3)	480
Set-up cost	1,000
Total	2,080
Minimum price each	104

Note: This is the mean of the two previous prices.**(d) Mass production**

- Total production = 20 watches for the special order + 140 watches for mass production = 160 watches or 16 batches.
- $y = ax^b$
 Average time/batch for first 2 batches (i.e. first 20 watches)
 $= 100 \times 2^{-0.3219} = 80$ hours
 Total time for first 2 batches = $80 \times 2 = 160$ hours (as before).
- Average time per batch for first 16 batches (i.e. first 160 watches) = $100 \times 16^{-0.321928} = 40.96$ hours
 Total time for first 16 batches = $40.96 \times 16 = 655.36$ hours.
 Hence total time for batches 3 to 16 (i.e. the 140 mass-produced units) = $(655.36 - 160)$ hours = 495.36 hours.

Cost of first 140 mass-production models:

	\$
Material (140 × \$30)	4,200
Labour and variable overhead (495.36 × \$3)	1,486
Marketing	250
Total cost	5,936
Revenue (140 × \$45)	6,300
Profit	364


Test your understanding 10 – Bike Racers Co

(1) **A**

No of bikes		Cumulative average time (hours)	Total time to date (hours)	Incremental time for additional bikes (hours)
1		50		50
2	($\times 0.8$)	40	80	$80 - 50 = 30$
Quotation				
Materials				\$1,000
Labour ($30 \times \$10$)				\$300
Overheads				\$600
Total cost				\$1,900
Profit (20%)				\$380
Selling price				\$2,280

(2) **A**

No of bikes		Cumulative average time (hours)	Total time to date (hours)	Incremental time for additional bikes (hours)
1		50		50
2	($\times 0.8$)	40	$40 \times 2 = 80$	$80 - 50 = 30$
4	($\times 0.8$)	32	$32 \times 4 = 128$	$128 - 80 = 48$
Quotation				
Materials				\$2,000
Labour ($48 \times \$10$)				\$480
Overheads				\$960
Total cost				\$3,440
Profit (20%)				\$688
Selling price				\$4,128
\$4,128/2 = \$2,064 per bike				

(3) B

No of bikes		Cumulative average time (hours)	Total time to date (hours)	Incremental time for additional bikes (hours)
1		50		50
2	($\times 0.8$)	40	$40 \times 2 = 80$	$80 - 50 = 30$
4	($\times 0.8$)	32	$32 \times 4 = 128$	$128 - 80 = 48$
8	($\times 0.8$)	25.6	$25.6 \times 8 = 204.8$	$204.8 - 128 = 76.8$

Quotation

Materials \$8,000

Labour ($204.8 \times \$10$) \$2,048

Overheads \$4,096

Total cost \$14,144

Profit (20%) \$2,828.8

Selling price for 8 bikes \$16,972.8 $\$16,972.8 / 8 = \$2,122$ per bike

(4) B

Cumulative number of bikes	Cumulative total hours	Cumulative average hours per unit
1	45	45
2	?	$45 \times r$
4	?	$45 \times r^2$
8	151.875	$45 \times r^3$

Using algebra: $151.875 = 8 \times (45 \times r^3)$ $18.98 = (45 \times r^3)$ $0.421875 = r^3$ **$r = 0.75$**

(5) **D**

Statements 3 and 4 are not correct. Careful and accurate budgeting will not always ensure the learning curve effects are favourably impacting on labour costs. The stable conditions necessary for the learning curve to take place may not be present. Unplanned changes in production techniques or labour turnover will cause problems and affect the learning rate. The employees need to be motivated, agree to the plan and keep to the learning schedule; these assumptions may not hold.

Also, accurate and appropriate learning curve data may be difficult to estimate.



Test your understanding 11 – Marcus Aurelius, continued

(a)

	\$000
Sales revenue = \$300k + (5 × \$150k) =	1,050
Sales revenue = \$300k + (5 × \$50k) =	550

(b) The second prediction is the more reliable as it involves interpolation. The first prediction goes beyond the original data upon which the regression line was based and thus assumes that the relationship will continue on in the same way, which may not be true.



Test your understanding 12 – A Co

A and D

The correlation is positive and hence values of Y typically increase as values of X increase.

Numerically, its 'r' value is close to 1 and hence the link between X and Y values is very strong.

We can never deduce cause and effect from any correlation coefficient, however large, so (F) is incorrect as are the numerical comments in (B) and (C).

(E) is incorrect because a linear relationship between ranks of values does not necessarily imply one between the values themselves.



Test your understanding 13 – Coefficient of determination

A

Coefficient of determination = $r^2 = 0.6 \times 0.6 = 0.36 = 36\%$


Test your understanding 14 – Eastoft Feeds and Fertilisers

Trend:

20X5	Q1	Q2	Q3	Q4
Average price per tonne	\$40	\$44	\$64	\$76
Seasonal variation	-\$4	-\$8	+\$4	+\$8
Trend	\$44	\$52	\$60	\$68

Forecast:

20X6	Q1	Q2	Q3	Q4
Trend (increase of \$8 per quarter)	\$76	\$84	\$92	\$100
Seasonal variation	-\$4	-\$8	+\$4	+\$8
Forecast price per tonne	\$72	\$76	\$96	\$108


Test your understanding 15 – IST Co

Next Year's sales = \$1,325,000 × (1 + 2%)

Next Year's sales = \$1,351,500

Next Year's quarterly sales = \$1,351,500/4 = \$337,875 per quarter

- Quarter 1 sales = \$337,875 + \$12,000 = \$349,875
- Quarter 2 sales = \$337,875 + \$18,000 = \$355,875
- Quarter 3 sales = \$337,875 – \$25,000 = \$312,875
- Quarter 4 sales = \$337,875 – \$5,000 = \$332,875

Quarter

\$

1	\$349,875
2	\$355,875
3	\$312,875
4	\$332,875
Year	\$1,351,500

Advanced variances

Chapter learning objectives

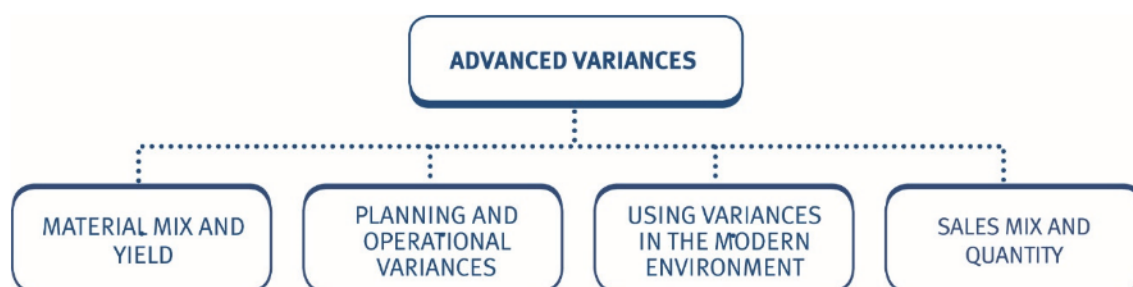
Upon completion of this chapter you will be able to:

- Calculate, identify the cause of, and explain material mix and yield variances.
- Explain the wider issues involved in changing material mix e.g. cost, quality and performance measurement issues.
- Identify and explain the relationship of the material usage variance with the material mix and yield variances.
- Suggest and justify alternative methods of controlling production processes.
- Calculate, identify the cause of, and explain sales mix and quantity variances.
- Identify and explain the relationship of the sales volume variances with the sales mix and quantity variances.
- Calculate a revised budget.
- Identify and explain those factors that could and could not be allowed to revise an original budget.
- Calculate, identify the cause of and explain planning and operational variances for:
 - (i) sales, including market size and market share
 - (ii) materials
 - (iii) labour, including the effect of the learning curve.
- Explain and discuss the manipulation issues involved in revising budgets.
- Analyse and evaluate past performance using the results of variance analysis.

- Use variance analysis to assess how future performance of an organisation can be improved.
- Identify the factors which influence behaviour.
- Discuss the effect that variances have on staff motivation and action.
- Describe the dysfunctional nature of some variances in the modern environment of JIT and TQM.
- Discuss the behavioural problems resulting from using standard costs in rapidly changing environments.



One of the PER performance objectives (PO13) is to plan business activities and control performance, making recommendations for improvement. Working through this chapter should help you understand how to demonstrate that objective.



1 Revision of basic variance analysis

Variance analysis is the process by which the total difference between standard and actual results is analysed.

Standard costing was revised in chapter 1, so you might want to recap this before starting this chapter if you are feeling rusty on the basics.

A number of basic variances can be calculated. If the results are better than expected, the variance is favourable (F). If the results are worse than expected, the variance is adverse (A).

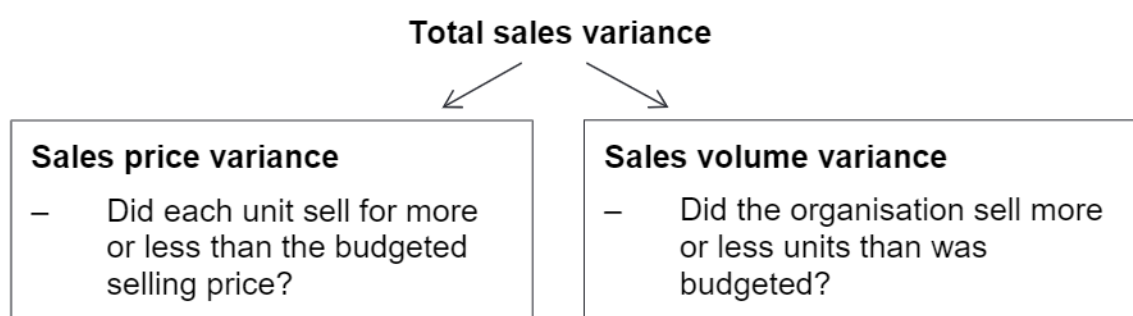
It is important to be able to:

- calculate the variance,
- explain the meaning of the variance calculated,
- identify possible causes for each variance.

Once the variances have been calculated, an operating statement can be prepared reconciling actual profit to budgeted profit. This can be done under marginal costing or under absorption costing principles.

Basic variances can be calculated for sales, material, labour, variable overheads and fixed overheads. Each of these will be reviewed in turn. (Please note: This is revision of the variances you will have seen as part of your Management Accounting (MA) exam, but they could still be tested as part of Performance Management (PM)).

2 Sales variances



Calculation

Actual Quantity sold × Actual price	(AQ AP)	}	
			Price variance
Actual Quantity sold × Standard price	(AQ SP)	}	
Actual Quantity sold × Standard Margin	(AQ SM)	}	
			Volume variance
Budget Quantity sold × Standard Margin	(BQ SM)		

Note: 'Margin' = contribution per unit (marginal costing) or profit per unit (absorption costing).



Test your understanding 1 – Sales variances

W Ltd has budgeted sales of 6,500 units but actually sold only 6,000 units. Its standard cost card is as follows:

	\$
Direct material	25
Direct wages	8
Variable overhead	4
Fixed overhead	18
	—
Total standard cost	55
Standard gross profit	5
	—
Standard selling price	60
	—

The actual selling price for the period was \$61.

Required:

Calculate the sales price and sales volume variance for the period:

- (a) Using absorption costing.
- (b) Using marginal costing.

3 Causes of sales variances

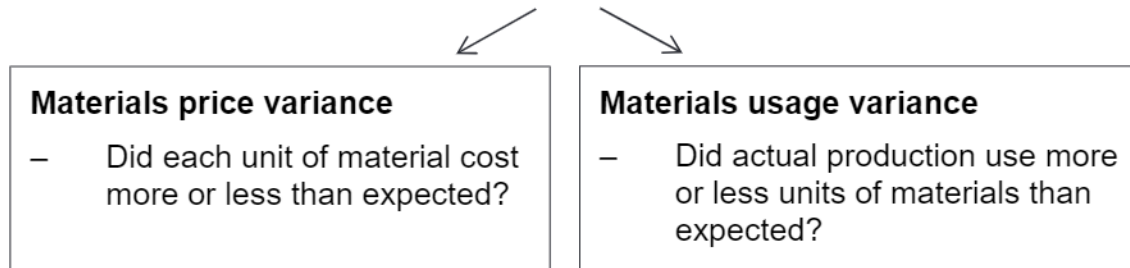
Variance	Favourable	Adverse
Sales price	Unexpected price increase due to: • higher than anticipated customer demand • lower than anticipated demand for competitor's products • an improvement in quality or performance	Unexpected price decrease due to: • lower than anticipated customer demand • higher than anticipated demand for competitor's products • a reduction in quality or performance
Sales volume	Unexpected increase in demand due to: • a lower price • improved quality or performance • a fall in quality or performance of competitor's products • a successful marketing campaign	Unexpected fall in demand due to: • a higher price • lower quality or performance of the product • an increase in quality or performance of competitor's products • an unsuccessful marketing campaign

Note: The sales price and volume variances may be linked. For example, an increase in the price of a product will result in a favourable sales price variance but may also result in an adverse sales volume variance, due to a fall in demand.



Materials variances

Total materials variance



Calculation

Actual Quantity Purchased × Actual price	(AQ AP)	} Price variance
Actual Quantity Purchased × Standard price	(AQ SP)	} Usage variance
Actual Quantity Used × Standard price	(AQ SP)	} Usage variance
Standard Quantity Used × Standard price (for actual production)	(SQ SP)	



Test your understanding 2 – Materials variances

James Marshall Co makes a single product with the following budgeted material costs per unit:

2 kg of material A at \$10/kg

Actual details:

Output 1,000 units

Material purchased and used 2,200 kg

Material cost \$20,900

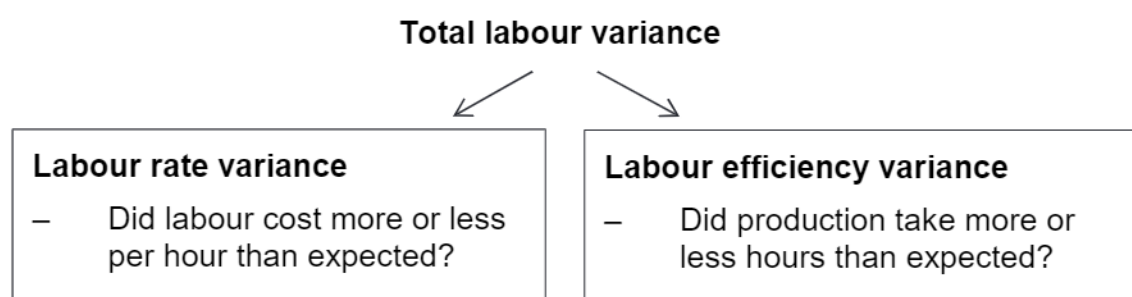
Calculate material price and usage variances.

Causes of material variances

Variance	Favourable	Adverse
Material price	- Poorer quality materials - Discounts given for buying in bulk - Change to a cheaper supplier - Incorrect budgeting	- Higher quality materials - Change to a more expensive supplier - Unexpected price increase encountered - Incorrect budgeting
Material usage	- Higher quality materials - More efficient use of material - Change in product specification - Incorrect budgeting	- Poorer quality materials - Less experienced staff using more materials - Change in product specification - Incorrect budgeting

Note: The material price variance and the material usage variance may be linked. For example, the purchase of poorer quality materials may result in a favourable price variance but an adverse usage variance.

Labour variances



Actual hours × Actual labour rate

Actual hours × Standard labour rate

Standard Hours (for actual level of production) × standard labour rate

(AH AR)	}	Rate variance
(AH SR)		
(SH SR)	}	Efficiency variance



Test your understanding 3 – Labour variances

Extract from the standard cost card for K Ltd

	\$
Direct labour:	
(15 hours @ \$4.80 per hour)	72

Actual direct wages for the period were:

15,500 hours costing \$69,750 in total

Actual units produced 1,000

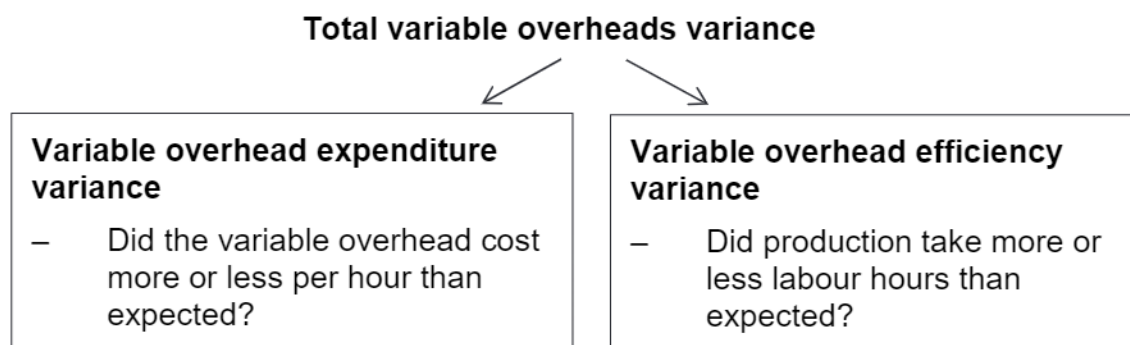
Calculate the labour rate and labour efficiency variances.

Causes of labour variances

Variance	Favourable	Adverse
Labour rate	• Lower skilled staff • Cut in overtime/bonus • Incorrect budgeting	• Higher skilled staff • Increase in overtime/bonus • Incorrect budgeting • Unforeseen wage increase
Labour efficiency	• Higher skilled staff • Improved staff motivation • Incorrect budgeting	• Lower skilled staff • Fall in staff motivation • Incorrect budgeting

Note: The labour rate variance and the labour efficiency variance may be linked. For example, employing more highly skilled labour may result in an adverse rate variance but a favourable efficiency variance.

Variable overhead variances



Actual hours × Actual variable overhead rates	(AH AR)	}	Expenditure variance
Actual hours × Standard variable overhead rate	(AH SR)		
		}	Efficiency variance
Standard Hours (for actual production) × Standard variable overhead rate	(SH SR)		



Test your understanding 4 – Variable overhead variances

Extract from the standard cost card for K Ltd

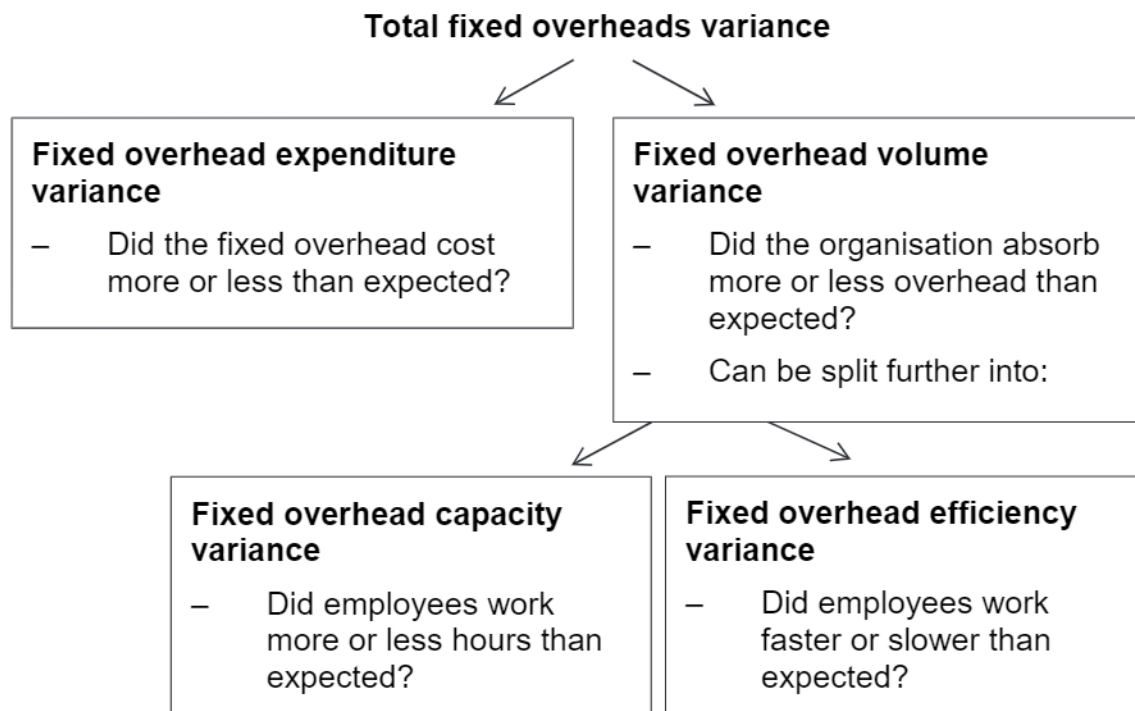
	\$
Variable overhead:	
15 hours @ \$1 per hour	15
Actual variable overheads for the period were:	
15,500 hours	Total cost \$14,900
Actual units produced 1,000	

Calculate the variable overhead expenditure and variable overhead efficiency variances.

Causes of variable overhead variances

Variance	Favourable	Adverse
Var. o/h expenditure	• Unexpected saving in cost of services • More economic use of services • Incorrect budgeting	• Unexpected increase in the cost of services • Less economic use of services • Incorrect budgeting
Var. o/h efficiency	• As for labour efficiency	• As for labour efficiency

Fixed overhead variances



Marginal costing system

With a marginal costing system, no overheads are absorbed, the amount spent is simply written off to the Statement of Profit or Loss.

So with marginal costing the only fixed overhead variance is the difference between what was budgeted to be spent and what was actually spent, i.e. the fixed overhead expenditure variance.

Absorption costing system

Under absorption costing we use an overhead absorption rate to absorb overheads. Variances will occur if this absorption rate is incorrect (just as we will get over/under-absorption).

So with absorption costing we calculate the fixed overhead expenditure variance and the fixed overhead volume variance.

The fixed overhead volume variance can be further split into a capacity and efficiency variance:

$$\text{Fixed OH volume variance} = \text{Fixed OH efficiency variance} + \text{Fixed OH capacity variance}$$

Calculation

Actual cost	(AH AR)	}	Expenditure variance	
Budgeted hours × Standard rate	(BH SR)			
Budgeted hours × Standard rate	(BH SR)	}	Capacity variance	
Actual hours × Standard rate	(AH SR)			
		}	Efficiency variance	
Standard hours × Standard rate (for actual production)	(SH SR)			
		}		Volume variance



Test your understanding 5 – Fixed overhead variances

The following information is available for J Ltd for Period 4:

Budget

Fixed production overheads	\$22,960
Units	6,560

The standard time to produce each unit is 2 hours

Actual

Fixed production overheads	\$24,200
Units	6,460
Labour hours	12,600 hrs

Required:

If J Ltd uses an absorption costing system, calculate the following:

- FOAR per labour hour
- Fixed overhead expenditure variance
- Fixed overhead capacity variance
- Fixed overhead efficiency variance
- Fixed overhead volume variance.

Causes of fixed overhead variances

Variance	Favourable	Adverse
Fixed o/h expenditure	- Decrease in price - Seasonal effects	- Increase in price - Seasonal effects
Fixed o/h volume	- Increase in production volume - Increase in demand - Change in productivity of labour	- Decrease in production volume - Decrease in demand - Production lost through strikes
Fixed o/h capacity	Hours worked higher than budget	Hours worked lower than budget
Fixed o/h efficiency	As for labour efficiency	As for labour efficiency

Operating statement under absorption costing

The purpose of calculating variances is to identify the different effects of each item of cost/income on profit compared to the expected profit. These variances are summarised in a reconciliation statement or operating statement.



Illustration 1 – Operating statement under absorption costing

Proforma operating statement under absorption costing (AC)

	\$
Budgeted profit	X
Sales volume profit variance	X/(X)
Standard profit on actual sales (= flexed budget profit)	X
Selling price variance	X/(X)

Cost variances:	F	A	
	\$	\$	
Material price	X	(X)	
Material usage	X	(X)	
Labour rate	X	(X)	
Labour efficiency	X	(X)	
Variable overhead expenditure	X	(X)	
Variable overhead efficiency	X	(X)	
Fixed production overhead expenditure variance	X	(X)	
Fixed production overhead capacity variance (*)	X	(X)	
Fixed production overhead efficiency variance(*)	X	(X)	X (X)
Actual profit			X

(*) The fixed overhead volume variance is split into a capacity and efficiency variance



Test your understanding 6 – AC operating statement

Riki Ltd, produces and sells one product only. The standard cost and price for one unit being as follows:

	\$
Direct material A – 10 kilograms at \$12 per kg	120
Direct material B – 6 kilograms at \$5 per kg	30
Direct wages – 5 hours at \$8 per hour	40
Fixed production overhead	60
Total standard cost	250
Standard gross profit	50
Standard selling price	300

The fixed production overhead included in the standard cost is based on an expected monthly output of 750 units. Riki Ltd use an absorption costing system.

During April the actual results were as follows:

	\$
Sales 700 units @ \$320	224,000
Direct materials:	
A: 7,500 kg	91,500
B: 3,500 kg	20,300
Direct wages 3,400 hours	27,880
Fixed production overhead	37,000
	176,680
Gross profit	47,320

Note: Riki Ltd does not hold any inventories.

Required:

You are required to reconcile budgeted profit with actual profit for the period, calculating the following variances:

Selling price, sales volume, material price, material usage, labour rate, labour efficiency, fixed overhead expenditure and fixed overhead volume.

Operating statement under marginal costing

The operating statement under marginal costing is the same as that under absorption costing except:

- a sales volume contribution variance is included instead of a sales volume profit variance
- the only fixed overhead variance is the expenditure variances
- the reconciliation is from budgeted to actual contribution then fixed overheads are deducted to arrive at a profit.



Illustration 2 – Operating statement under marginal costing

Proforma operating statement under marginal costing (MC)

	\$
Budgeted contribution	
(budgeted production × budgeted contrn/unit)	X
Sales volume contribution variance	X(X)
Standard contribution on actual sales	
(= flexed budget contribution)	X
Selling price variance	X(X)
	X

Variable cost variances:

	F	A	
	\$	\$	\$
Material price	X	(X)	
Material usage	X	(X)	
Labour rate	X	(X)	
Labour efficiency	X	(X)	
Variable overhead expenditure	X	(X)	
Variable overhead efficiency	X	(X)	
Total	X	(X)	X(X)
Actual contribution			X
Budgeted fixed production overhead			X
Fixed overhead expenditure variance			X(X)
Actual profit			X

**Test your understanding 7 – MC operating statement**

Chapel Ltd manufactures a chemical protective called Rustnot. The following standard costs apply for the production of 100 cylinders:

		\$
Materials	500 kgs @ \$0.80 per kg	400
Labour	20 hours @ \$1.50 per hour	30
Fixed overheads	20 hours @ \$1.00 per hour	20
		450

The monthly production/sales budget is 10,000 cylinders.

Selling price = \$6 per cylinder.

For the month of November the following production and sales information is available:

Produced/sold	10,600 cylinders
Sales value	\$63,000
Materials purchased and used	53,200 kgs
Labour	2,040 hours
Fixed overheads	\$2,200

Required:

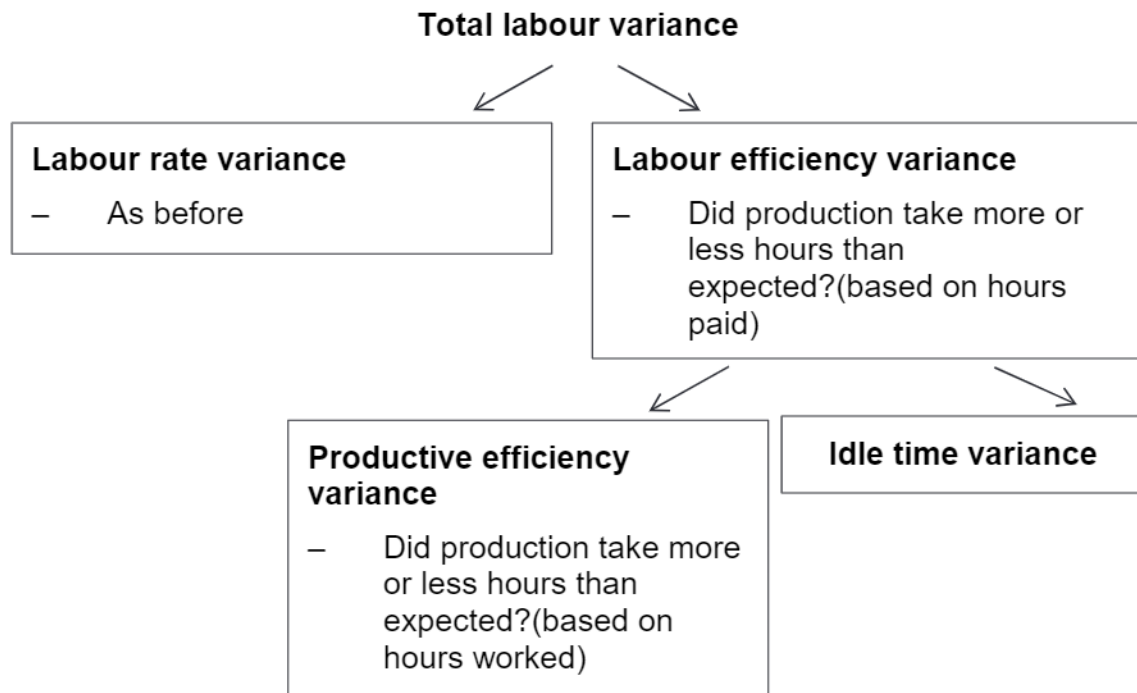
You are required to prepare an operating statement in a marginal costing format for November detailing all the variances.

Labour idle time and material waste

Idle time

Idle time occurs when employees are paid for time when they are not working e.g. due to machine breakdown, low demand or stockouts.

If idle time exists an idle time labour variance should be calculated.



Actual Hours paid × Actual Rate	(AHp AR)	} Rate variance
Actual Hours paid × Standard Rate	(AHp SR)	
Actual Hours worked × Standard Rate	(AHw SR)	} Idle time variance
Standard Hours worked for actual production × Standard Rate	(SH SR)	
		} Productive Efficiency variance

4 Controlling idle time and waste

Idle time can be prevented or reduced considerably by:

- (1) Proper maintenance of tools and machinery
- (2) Advanced production planning
- (3) Timely procurement of stores
- (4) Assurance of supply of power
- (5) Advance planning for machine utilisation.

Material waste

Material waste may also be a normal part of a process and could be caused by:

- evaporation
- scrapping
- testing.

Waste would affect the material usage variance.

The purchasing of materials is a highly specialised function, that can control waste by:

- (1) Ordering the right quantity and quality of materials at the most favourable price
- (2) Ensuring the material arrives at the right time in the production process
- (3) Take active measures against theft, deterioration, breakage and additional storage costs.

When should a variance be investigated?

Factors to consider include:

Size

A standard is an average expected cost and therefore small variations between the actual and the standard are bound to occur. These are uncontrollable variances and should not be investigated.

In addition, a business may decide to only investigate variances above a certain amount. The following techniques could be used:

- Fixed size of variance, e.g. investigate all variances over \$5,000
- Fixed percentage rule, e.g. investigate all variances over 10% of the budget
- Statistical decision rule, e.g. investigate all variances of which there is a likelihood of less than 5% that it could have arisen randomly.

Favourable or adverse

Firms often treat adverse variances as more important than favourable and therefore any investigation may concentrate on these adverse variances.

Cost

For investigation to be worthwhile, the cost of investigation must be less than the benefits of correcting the cause of the variance.

Past pattern

Variances should be monitored for a number of periods in order to identify any trends in the variances. A firm would focus its investigation on any steadily worsening trends.

The budget

The budget may be unreliable or unrealistic. Therefore, the variances would be uncontrollable and call for a change in the budget or an improvement in the budgeting process, not an investigation of the variance.

Reliability of figures

The system for measuring and recording the figures may be unreliable. If this is the case, the variances will be meaningless and should not be investigated.

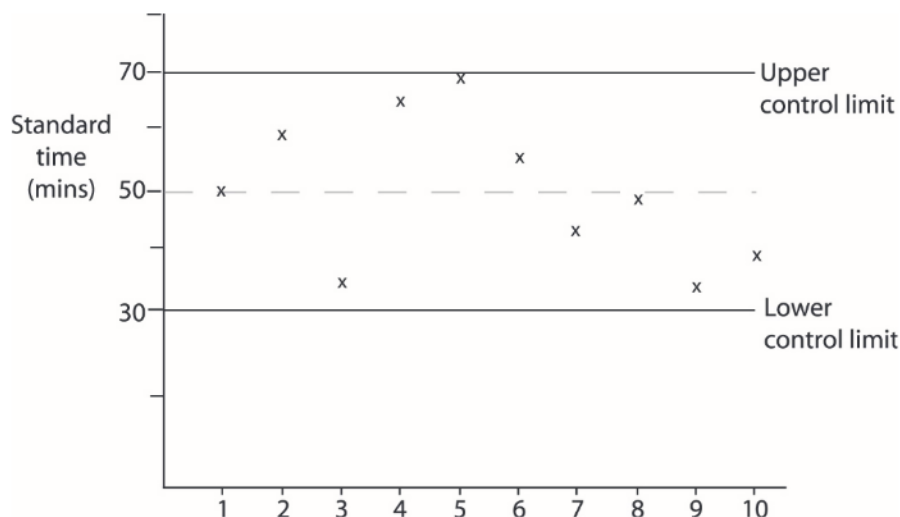
A process has a standard time of 50 minutes. Control limits may be set as a fixed amount, a fixed percentage or using a statistical model. Assume they are set at a fixed amount 30 and 70 minutes, and actual times recorded as follows:



Methods used when investigating variances

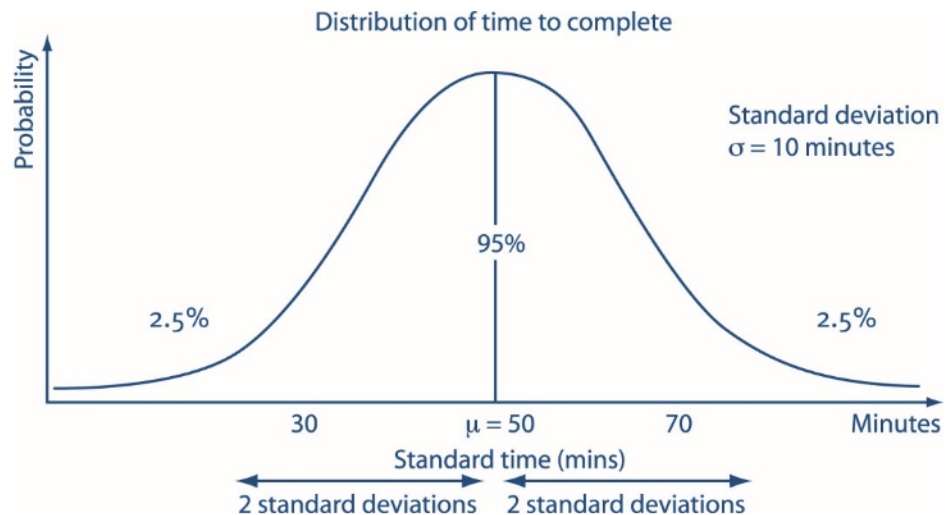
A process has a standard time of 50 minutes. Control limits may be set as a fixed amount, a fixed percentage or using a statistical model.

Assume they are set at a fixed amount 30 and 70 minutes, and actual times recorded as follows:



If the actual time taken falls within the bands, the variance is not significant.

Control limits should be set so that there is only a small chance of a random fluctuation falling outside them.

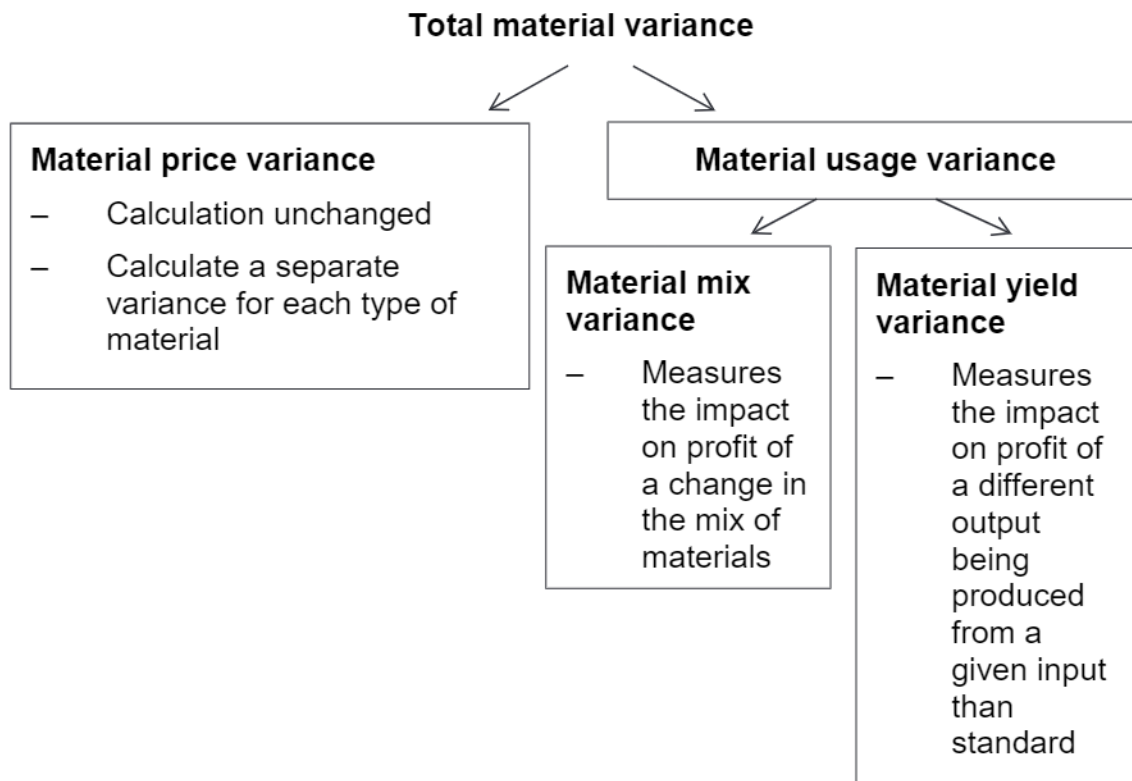


- In this example the control limits are set two standard deviations from the mean. This means that 95% of the recorded process times should lie within the control limits.
- The actual time is recorded on the chart after the completion of each process. It will soon be apparent if the mean time is shifting from 50 minutes, as the recorded times move outside the control limits.
- If more than 5% of the observed results do lie outside the control limits, then the system may be referred to as being statistically out of control. At this stage management must decide what further action to take.

5 Material mix and yield

Material mix and yield variances are calculated if:

- A product contains more than one type of material.
- These materials are interchangeable.
- There was a change in the proportions of the input materials.



A **mix** variance is used to monitor the cost of material. The mix variance is looking at the change in the cost of materials when the input materials are used in different proportions to the set standard.

For instance, if more of an expensive material has been used and less of a cheap material, then the cost will be higher – and the variance adverse.

Method:

Material	Actual Quantity, Actual Mix (AQAM)	Actual Quantity, Standard Mix (AQSM)	Difference	@ standard price	Variance in \$
M ₁	X kgs	A kgs	A – X	\$x ₁ /kg	\$Var (F/A)
M ₂	Y kgs	B kgs	B – Y	\$x ₂ /kg	\$Var (F/A)
M ₃	Z kgs	C kgs	C – Z	\$x ₃ /kg	\$Var (F/A)
	Sum (X+Y+Z)	Sum (X+Y+Z)	(Total = 0)		\$ Total mix (F/A)

- (1) Write down the actual input of each material in a column (this is the **actual total quantity split in the actual mix = AQAM**).
- (2) Take the actual input in total and copy it across to another column. Then, work backwards from this to split the materials in the standard proportions (this is the **actual total quantity split in the standard mix = AQSM**).
- (3) Calculate the difference between the standard mix (AQSM) and the actual mix (AQAM). This is the mix variance in terms of physical quantities, and must add up to zero in total. (If you use a higher than expected proportion of one material, you must use a lower than expected proportion of something else!)
- (4) Multiply the difference by the standard price per kilogram.
- (5) This gives the mix variance in financial terms.



Test your understanding 8 – Material mix

Hondru operates a standard costing system. The standard direct materials to produce 1,000 units of output is as follows:

Material grade	Input quantity (kgs)	Standard price per kg (\$)
A	600	1.10
B	240	2.40
C	360	1.50

During April the actual output of the product was 21,000 units. The actual materials issued to production were:

Material grade	Quantity (kgs)
A	14,000
B	5,500
C	5,500

Required:

Calculate the material mix variance for each material, and in total. Comment on the figures calculated.

6 Material yield

A yield variance measures the efficiency of turning the inputs into outputs. If the yield variance is adverse, it suggests that actual output is lower than the expected output. This could be due to labour inefficiencies, higher waste, inferior materials, or using a cheaper mix with a lower yield.

Yield Variance Method 1: The 'total' method

Actual output (in units)	X
Expected outputs from actual input (in units)	Y
Difference: favourable/(adverse)	X – Y
Multiplied by standard material cost per unit of output	\$
Yield variance: favourable/(adverse)	(X – Y) × \$

Method 2: The 'individual' method

Material	Actual Quantity, Standard Mix (AQSM)	Standard Quantity, Standard Mix (SQSM)	Difference	@ standard price	Variance in \$
M ₁	A kgs	D kgs	D – A	\$x ₁ /kg	\$Var (F/A)
M ₂	B kgs	E kgs	E – B	\$x ₂ /kg	\$Var (F/A)
M ₃	C kgs	F kgs	F – C	\$x ₃ /kg	\$Var (F/A)
					\$ Total yield (F/A)

SQSM is the standard quantity of material used for actual production, shared in the standard mix.

- (1) Copy **Actual Quantity, Standard Mix (AQSM)** from the mix variance.
- (2) Calculate **Standard Quantity, Standard Mix (SQSM)** for EACH material using the following formula:

Material quantity used per unit from standard cost card × Total actual output produced

Or

Calculate the total standard quantity of all materials used to produce the actual output then share this out between the different materials using the standard proportions calculated from the standard cost card.

- (3) Calculate difference between the Standard Quantity, Standard Mix (SQSM) and Actual Quantity, Standard Mix (AQSM) for each material.
- (4) Multiply by the difference by the standard price per kilogram.
- (5) This gives the yield variance in financial terms.


Test your understanding 9 – Material yield

Hondru operates a standard costing system. The standard direct materials to produce 1,000 units of output is as follows:

Material grade	Input quantity (kgs)	Standard price per kg (\$)
A	600	1.10
B	240	2.40
C	360	1.50

During April the actual output of the product was 21,000 units. The actual materials issued to production were:

Material grade	Quantity (kgs)
A	14,000
B	5,500
C	5,500

Required:

Calculate the material yield variance. Comment on the figures calculated.


Test your understanding 10 – Material mix and yield

A company manufactures a chemical using two components, A and B. The standard information for one unit of the chemical are as follows:

		\$
Material A	10 kg at \$4 per kg	40
Material B	20 kg at \$6 per kg	120
		—
		160
		—

In a particular period, 160 units of the chemical were produced, using 1,000 kgs of material A and 1,460 kgs of material B.

Required:

Calculate the material usage, mix and yield variances for each material.

7 Interpretation of material mix and yield variances

Mix – a favourable total mix variance would suggest that a higher proportion of a cheaper material is being used hence reducing the overall average cost per unit.

Yield – an adverse total yield variance would suggest that less output has been achieved for a given input, i.e. that the total input in volume is more than expected for the output achieved.

- These variances may be interrelated. A favourable material mix variance may lead to an adverse material yield variance. This is due to differences in quality between the materials used.
- Any change in mix should be judged by the impact on the overall total materials variance.
- The operating statement would include a separate line for each variance.



Test your understanding 11 – Mix and yield with material waste

Pan-Ocean Chemicals has one product, which requires inputs from three types of material to produce batches of Synthon. Standard cost details for a single batch are shown below:

Material type	Standard quantity (kgs)	Standard price per kg (\$)
S1	8	0.30
S2	5	0.50
S3	3	0.40

A standard loss of 10% of input is expected. Actual output was 15,408 kgs for the previous week. Details of the material used were:

Material grade	Quantity (kgs)
S1	8,284
S2	7,535
S3	3,334

Required:

Calculate the individual material mix and yield and the total usage variance.

Changing the mix – the wider issues

It has already been shown that changing the mix of material input can affect the material yield of the process. It can impact on:

- cost
- quality
- performance measurement.



Illustration 3 – Mix and yield: wider issues

A company produces pre-cast concrete sections for the construction industry. The mix of materials used to produce the concrete can be varied and different mixes are suitable for different products. Discuss the issues that management should consider when setting standard material costs.

Solution

For each product management should consider the optimum mix of input materials that will maximise profits to the business. This may involve consideration of:

- the relationship between cost, quality and price. Reducing the cost of input materials by using a greater proportion of a cheaper material may reduce the quality of the product and lead to a reduction in the price that can be charged
- costs of reduced quality. Using a greater proportion of a cheaper input material may lead to higher quality failure costs
- impact on other variances. Increasing the proportion of a cheaper input material may result in increased labour costs or overhead costs if this leads to more time having to be spent producing a product. Increased rejects may lead to higher overhead costs.

It may be the case that, whilst changing a material mix could lead to an overall favourable material variance this could have an adverse impact on the profitability of the business if prices have to be reduced because of reduced quality or quality failure costs exceed material cost savings. Thus it is important to set the standard mix at the level which optimises profit taking all factors into consideration.



Test your understanding 12

Discuss how the performance measurement system should be designed when the mix of input materials can be varied in a process.

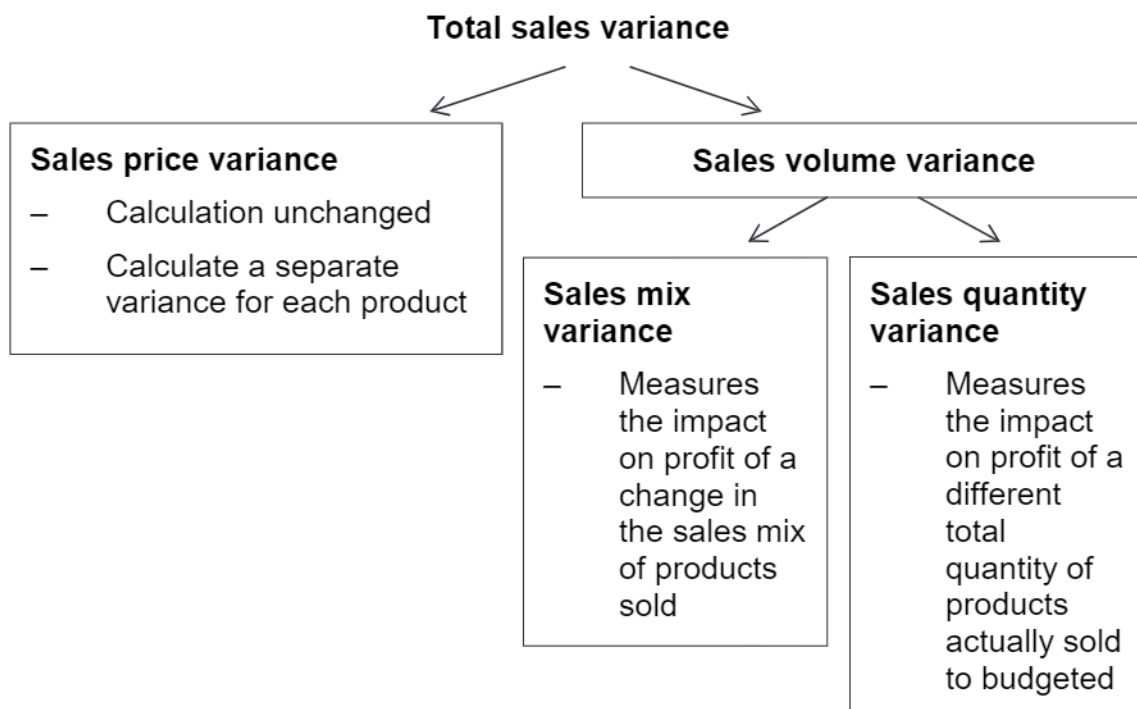
The control of production processes in manufacturing environments

As well as variances, organisations can also use other performance measures and targets for controlling production processes, e.g.:

- quality measures e.g. reject rate, time spent reworking goods, % waste, % yield
- average cost of inputs
- average cost of outputs
- average prices achieved for finished products
- average margins
- % on-time deliveries
- customer satisfaction ratings
- detailed timesheets
- % idle time.

8 Sales mix and quantity variances

Sales variances can be explained as follows:



Context

Sales price and volume variances were first met in 'Management Accounting' (MA) and recapped at the beginning of this chapter.

- Sales price variances are calculated for each product separately by comparing the actual selling price per unit and the budgeted selling price per unit; each price variance is multiplied by the number of units for each type of product.
- Similarly sales volume variances are calculated for each product separately by comparing the actual number of units sold, and the budgeted number. Each difference is multiplied by the budgeted profit per unit.

In ACCA PM, we introduce the idea that instead of **separate** sales volume variances, a firm may prefer to calculate **combined** sales mix and sales quantity variances.

This is only valid if the concept of sales mix is meaningful – would customer choose to buy product A instead of B – has **substitution** occurred? For example, considering car manufacturers:

- Based on differences in price a customer may choose to upgrade and buy a more expensive deluxe variant of a particular car model, so the concept of mix is a useful management tool when discussing sales of variants within a particular range – e.g. did we sell more DLX versions instead of SL versions?
- However, it is highly unlikely customers would choose to buy a lorry instead of a car based on price differences so the concept of mix is less useful when looking at the overall product range. Keeping the variances separate would be more appropriate.

Sales mix variances

A sales mix variance indicates the effect on profit of changing the mix of actual sales from the standard mix. A sales mix variance can be calculated in one of two ways:

Method 1:

The difference between the actual total quantity sold in the standard mix and the actual quantities sold, valued at the standard profit per unit:

Product	Actual Quantity, Actual Mix (AQAM)	Actual Quantity, Standard Mix (AQSM)	Difference	@ standard margin	Variance in \$
P ₁	X units	A units	X – A	\$M ₁	\$Var(F/A)
P ₂	Y units	B units	Y – B	\$M ₂	\$Var (F/A)
P ₃	Z units	C units	Z – C	\$M ₃	\$Var (F/A)
	Sum (X+Y+Z)	Sum (X+Y+Z)	(Total = 0)		\$ Total sales mix

- (1) Write down the actual sales quantity for each product in a column (this is the **actual total sales quantity split in the actual mix = AQAM**).

- (2) Take the actual sales quantity in total and copy it across to another column. Then, work it back in the standard proportions (this is the **actual total sales quantity split in the standard mix = AQSM**).
- (3) Calculate the difference between the standard mix (AQSM) and the actual mix (AQAM). This is the mix variance in terms of physical quantities (units), and must add up to zero in total. (If you sell a higher than expected proportion of one product, you must sell a lower than expected proportion of something else!)
- (4) Multiply the difference by the standard margin per unit.
- (5) This gives the sales mix variance in financial terms.

Method 2:

The difference between the actual sales and budgeted sales, valued at the standard profit per unit less the budgeted weighted average profit per unit.

Product	Actual Sales Quantity, Actual Mix (AQAM)	Actual Sales Quantity, Standard Mix (AQSM)	Difference	Standard margin	Weighted average standard margin	Difference	Variance in \$
P ₁	X units	A units	X – A	\$M ₁	\$M _A	M ₁ – M _A	\$Var (F/A)
P ₂	Y units	B units	Y – B	\$M ₂	\$M _A	M ₂ – M _A	\$Var (F/A)
P ₃	Z units	C units	Z – C	\$M ₃	\$M _A	M ₃ – M _A	\$Var (F/A)
	Sum (X+Y+Z)	Sum (X+Y+Z)	(Total = 0)				\$ Total sales mix

Sales quantity variances

A **sales quantity variance** indicates the effect on profit of selling a different total quantity from the budgeted total quantity. Like the mix variance, it can be calculated in one of two ways:

Method 1:

The difference between actual sales volume in the standard mix and budgeted sales valued at the standard profit per unit.

Product	Actual Sales Quantity, Standard Mix (AQSM)	Budget Sales Quantity, Standard Mix (BQSM)	Difference	@ standard margin	Variance in \$
P ₁	A units	D units	A – D	\$M ₁	\$Var.(F/A)
P ₂	B units	E units	B – E	\$M ₂	\$Var (F/A)
P ₃	C units	F units	C – F	\$M ₃	\$Var (F/A)
					\$ Total sales quantity

- (1) Copy Actual Quantity, Standard Mix (AQSM) from the mix variance method 1.
- (2) Copy the budgeted sales units under the column Budget Sales Quantity, Standard Mix (BQSM).

- (3) Calculate difference between the Actual Sales Quantity, Standard Mix (AQSM) and Budgeted Sales Quantity, Standard Mix (BQSM) for each product.
- (4) Multiply by the difference by the standard margin per unit.
- (5) This gives the sales quantity variance in financial terms.

Method 2:

The difference between actual sales volume and budgeted sales valued at the weighted average profit per unit.

Sales quantity variance = (Actual total sales quantity – budgeted total sales quantity) × Standard weighted average margin.

This could also be laid out as:

Actual total sales quantities (units)	X
Budgeted total sales quantity (units)	Y
Difference: favourable/(adverse)	X – Y
Multiplied by standard weighted average margin per unit	\$
Sales quantity variance: favourable/(adverse)	(X – Y) × \$



Test your understanding 13 – Sales mix and quantity variances

Furniture Co operates a marginal costing system and sells two products Sofas (S) and Tables (T) as part of a suite. The standard contribution per unit for each product and the budgeted levels of production and sales for each product for the last period are as follows:

Product	S	T
Standard contribution per unit	\$5.00	\$6.00
Budgeted production and sales (units)	8,000	12,000

The actual contribution per unit for each product and the actual levels of production and sales for each product for the last period are as follows:

Product	S	T
Actual contribution per unit	\$5.50	\$6.50
Actual production and sales (units)	9,500	11,000

Required:

Calculate the following variances for the last period:

- (i) sales mix contribution variance
- (ii) sales quantity contribution variance.


Test your understanding 14 – Sales mix and quantity variances

CAB Co operates an absorption costing system and sells three products B, R and K which are substitutes for each other. The following standard selling price and cost data relate to these three products:

Product	Unit selling price	Direct material/unit	Direct labour/unit
B	\$14.00	3 kgs @ \$1.80/kg	0.5 hours @ \$6.50/hour
R	\$15.00	1.25 kgs @ \$3.28/kg	0.8 hours @ \$6.50/hour
K	\$18.00	1.94 kgs @ \$2.50/kg	0.7 hours @ \$6.50/hour

Budgeted fixed production overhead for the last period was \$81,000. This was absorbed on a machine hour basis. The standard machine hours for each product and the budgeted levels of production and sales for each product for the last period are as follows:

Product	B	R	K
Standard machine hours per unit	0.3 hours	0.6 hours	0.8 hours
Budgeted production and sales (units)	10,000	13,000	9,000

Actual volumes and selling prices for the three products in the last period were as follows:

Product	B	R	K
Actual selling price per unit	\$14.50	\$15.50	\$19.00
Actual production and sales (units)	9,500	13,500	8,500

Required:

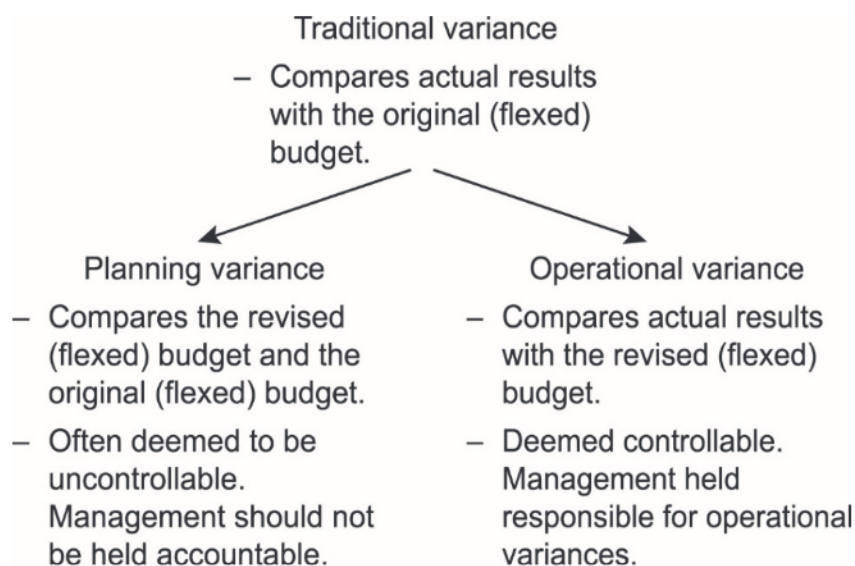
Calculate the following variances for overall sales for the last period:

- sales price variance
- sales volume profit variance
- sales mix profit variance
- sales quantity profit variance.

9 Planning and operational variances

The standard is set as part of the budgeting process which occurs before the period to which it relates.

This means that the difference between standard and actual may arise partly due to an unrealistic budget and not solely due to operational factors. The budget may need to be **revised** to enable actual performance to be compared with a standard that reflects these changed conditions.



The original flexed budget is said to be **ex-ante** (i.e. the flexed budget based on the standards **before** the budget has been revised) and the revised budget is said to be **ex-post** (the flexed budget based on the standards **after** the budget has been revised).

Planning and operational variances may be calculated for:

- Sales
- Materials
- Labour.

The operating statement would include a separate line for each variance calculated.

Each of the variances will be reviewed in turn.



Benefits and problems of planning and operating variances

Benefits of planning and operational variances

- In volatile and changing environments, standard costing and variance analysis are more useful using this approach.
- Operational variances provide up to date information about current levels of efficiency.

- Operational variances are likely to make the standard costing system more acceptable and to have a positive effect on motivation.
- It emphasises the importance of the planning function in the preparation of standards and helps to identify planning deficiencies.

Problems of planning and operational variances

- There is an element of subjectivity in determining the ex-post standards as to what is 'realistic'.
- There is a large amount of labour time involved in continually establishing up to date standards and calculating additional variances.
- There is a great temptation to put as much as possible of the total variances down to outside, uncontrollable factors, i.e. planning variances.
- There can then be a conflict between operating and planning staff, each laying the blame at each other's door.

On the face of it, the calculation of operational and planning variances is an improvement over the traditional analysis. However, you should not overlook the considerable problem of data collection for the revised analysis: where does this information come from, and how can we say with certainty what should have been known at a particular point in time?

Planning and operational variances for sales

The sales volume variance can be sub-divided into a planning and operational variance:

Actual sales quantity x standard margin	}	Market share variance (operational)
Revised budgeted sales x standard margin (to achieve target share of actual market)		
Original budgeted sales x standard margin		Market size variance (planning)



Test your understanding 15 – Market size and share

Hudson has a sales budget of 400,000 units for the coming year based on 20% of the total market. On each unit, Hudson makes a profit of \$3. Actual sales for the year were 450,000, but industry reports showed that the total market volume had been 2.2 million.

- Find the traditional sales volume variance.
- Split this into planning and operational variances (market size and market share). Comment on your results.



Test your understanding 16 – Additional example

A company sets its sales budget based on an average price of \$14 per unit and sales volume of 250,000 units. Competition was more intense than expected and the company only achieved sales of 220,000 and had to sell at a discounted price of \$12.50 per unit. The company was unable to reduce costs so profit per unit fell from \$4 per unit to \$2.50 per unit. It was estimated that the total market volume grew by 10% from 1,000,000 units to 1,100,000 units.

Required:

- Calculate the sales price and volume variances.
- Analyse the volume variances into market share and market size.
- Discuss whether the price variance is a planning or operational variance.



Test your understanding 17 – The Alpha Company

The Alpha Company operates an absorption costing system and sells three products A, B and C. Each product line is managed by a divisional manager (Manager A, Manager B and Manager C) who is only responsible for his/her line of products. Sales budgets information on the three products is provided as follows:

Product	Sales units	Standard profit per unit	Budgeted profit
A	400 units	\$8	\$3,200
B	600 units	\$6	\$3,600
C	1,000 units	\$4	\$4,000

Actual sales are achieved at the standard selling price, as follows:

Product	Sales units	Standard profit per unit	Budgeted profit
A	300 units	\$8	\$2,400
B	700 units	\$6	\$4,200
C	1,200 units	\$4	\$4,800

(1) What is the sales quantity variance?

- \$0
- \$480 F
- \$480 A
- \$1,080 F

- (2) **Which of the following statements regarding market size variances are true are true?**
- (1) A fall or increase in market size is uncontrollable by management, and therefore results in a planning variance.
 - (2) The sales volume planning variance reveals the extent of which the original standard (estimation of market size) was at fault.
 - (3) Managers should be appraised on both the operational and planning variances for sales.
- A Statements (1) and (2)
B Statements (2) and (3)
C Statements (1) and (3)
D None of these statements are true.
- (3) **Which of the following statements regarding the sales mix variance in the Alpha Company are true?**
- (1) The overall mix variance is adverse because more products with a higher profit per unit are sold, in place of products with a lower profit per unit.
 - (2) The actual proportion of products B and C, which have a lower profit per unit, is more than the budgeted proportion whereas the actual proportion of product A, which yields a higher profit per unit, is lower than budgeted.
 - (3) Providing a manager with a sales mix variance when they can only control one product is meaningless.
- A Only statements (1) and (2)
B Only statements (2) and (3)
C Only statements (1) and (3)
D All statements
- (4) A recession in 20X4 meant that the market for all of the company's products declined by 10%.
- What is the market size variance (planning variance) for product B in 20X4?**
- A \$200 A
B \$360 F
C \$360 A
D \$960 F

- (5) A recession in 20X4 meant that the market for all of the company's products declined by 10%.

What is the market share variance (operational variance) for product B in 20X4?

- A \$200 A
- B \$360 F
- C \$360 A
- D \$960 F

Planning and operational variances for materials

Planning and operational variances can be calculated for materials in the same way as above.



Test your understanding 18 – Price variances

The standard cost per unit of raw material was estimated to be \$5.20 per unit. However, due to subsequent improvements in technology, the general market price at the time of purchase was \$5.00 per unit. The actual price paid was \$5.18 per unit. 10,000 units of the raw materials were purchased during the period.

Required:

Calculate the planning and operational materials price variances. Comment on the results.



Test your understanding 19 – Price and usage variances

Holmes Ltd uses one raw material for one of their products. The standard cost per unit at the beginning of the year was \$28, made up as follows:

Standard material cost per unit = 7 kg per unit at \$4 per kg = \$28.

In the middle of the year the supplier had changed the specification of the material slightly due to problems experienced in the country of origin, so that the standard had to be revised as follows:

Standard material cost per unit = 8 kg per unit at \$3.80 per kg = \$30.40.

The actual output for November was 1,400 units. 11,000 kg of material was purchased and used at a cost of \$41,500.

Calculate

- (a) material price and usage variances using the traditional method
- (b) all planning and operational material variances.

Planning and operational variances for labour

Planning and operational variances for labour can be calculated in the same way as for materials.



Test your understanding 20

The standard hours per unit of production for a product is 5 hours. Actual production for the period was 250 units and actual hours worked were 1,450 hours. The standard rate per hour was \$10. Because of a shortage of skilled labour it has been necessary to use unskilled labour and it is estimated that this will increase the time taken by 20%.

Required:

Calculate the planning and operational efficiency variances.



Test your understanding 21 – Learning curves and variances

The direct labour efficiency variance in respect of a new product has been calculated as \$14,700 Favourable. The variance was calculated using standard cost data which showed that each unit of the product was expected to take 8 hours to produce, at a cost of \$15 per hour.

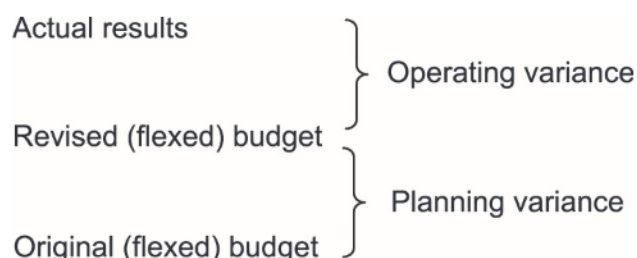
The actual output was 560 units, and the actual time worked in the manufacture of the product totalled 3,500 hours, at a cost of \$57,750. However, the production manager now realises that the standard time of 8 hours per unit was the time taken to produce the first unit and that a learning curve rate of 90% should have been anticipated for the first 600 units.

Required:

Calculate the planning and operational efficiency variances for labour efficiency, following the recognition of the learning curve effect ($b = -0.1520$ for a 90% learning curve).

Revising the budget

When applying planning and operating principles to cost variances (material and labour), care must be taken over flexing the budgets. The accepted approach for use in the exam is to flex both the original and revised budgets to actual production levels:



Note: If pushed for time in the exam, then calculate detailed operating variances but give a single total planning variance for each category.

When should a budget be revised?

There must be a good reason for deciding that the original standard cost is unrealistic. Deciding in retrospect that expected costs should be different from the standard should not be an arbitrary decision, aimed perhaps at shifting the blame for bad results due to poor operational management or poor cost estimation.

A good reason for a change in the standard might be:

- a change in one of the main materials used to make a product or provide a service
- an unexpected increase in the price of materials due to a rapid increase in world market prices (e.g. the price of oil or other commodities)
- a change in working methods and procedures that alters the expected direct labour time for a product or service
- an unexpected change in the rate of pay to the workforce.

These types of situations do not occur frequently. The need to report planning and operational variances should therefore be an occasional, rather than a regular, event.

If the budget is revised on a regular basis, the reasons for this should be investigated. It may be due to management attempting to shift the blame for poor results or due to a poor planning process.



Illustration 4 – Revising the budget

Rhodes Ltd manufactures Stops which it is estimated require 2 kg of material XYZ at \$10/kg. In week 21 only 250 Stops were produced although budgeted production was 300. 450 kg of XYZ were purchased and used in the week at a total cost of \$5,100. Later it was found that the standard had failed to allow for a 10% price increase throughout the material supplier's industry. Rhodes Ltd carries no stocks.

Planning and operational analysis

The first step in the analysis is to calculate:

- (1) Actual results
- (2) Revised flexed budget (ex-post)
- (3) Original flexed budget (ex-ante).

(W1)	Actual results		
	450 kgs for	\$5,100	
			Operational variance
(W2)	Revised flexed budget (ex post)		
	250 units at 2 kg per unit for \$11/kg =	\$5,500	
			Planning variance
(W3)	Original flexed budget (ex ante)		
	250 units at 2 kg per unit for \$10/kg =	\$5,000	



Additional example on revising the budget

A transport business makes a particular journey regularly, and has established that the standard fuel cost for each journey is 20 litres of fuel at \$2 per litre. New legislation has forced a change in the vehicle used for the journey and an unexpected rise in fuel costs. It is decided retrospectively that the standard cost per journey should have been 18 litres at \$2.50 per litre.

Required:

Calculate the original and revised flexed budgets if the journey is made 120 times in the period.

Solution

Original flexed budget:

$$120 \times 20 \times \$2 = \$4,800$$

Revised flexed budget:

$$120 \times 18 \times \$2.50 = \$5,400$$



Pros and cons of revising the budget

A company is operating in a fast changing environment and is considering whether analysing existing variances into a planning and operational element would help to improve performance. Discuss the advantages and disadvantages of the approach.

Solution

Advantages may include:

- Variances are more relevant, especially in a turbulent environment.
- The operational variances give a 'fair' reflection of the actual results achieved in the actual conditions that existed.
- Managers are, theoretically, more likely to accept and be motivated by the variances reported which provide a better measure of their performance.
- The analysis helps in the standard-setting learning process, which will hopefully result in more useful standards in the future.

Disadvantages:

- The establishment of ex-post budgets is very difficult. Managers whose performance is reported to be poor using such a budget are unlikely to accept them as performance measures because of the subjectivity in setting such budgets.
- There is a considerable amount of administrative work involved first to analyse the traditional variances and then to decide on which are controllable and which are uncontrollable.
- The analysis tends to exaggerate the interrelationship of variances, providing managers with a 'pre-packed' list of excuses for below standard performance. Poor performance is often excused as being the fault of a badly set budget.
- Frequent demands for budget revisions may result in bias.

Variance analysis in the modern manufacturing environment

Variance analysis may not be appropriate because:

Non-standard products

Standard product costs apply to manufacturing environments in which quantities of an identical product are output from the production process. They are not suitable for manufacturing environments where products are non-standard or are customised to customer specifications.

Standard costs become outdated quickly

Shorter product life cycles in the modern business environment mean that standard costs will need to be reviewed and updated frequently.

This will increase the cost of operating a standard cost system but, if the standards are not updated regularly, they will be of limited use for planning and control purposes. The extra work involved in maintaining up-to-date standards might limit the usefulness and relevance of a standard costing system.

Production is highly automated

It is doubtful whether standard costing is of much value for performance setting and control in automated manufacturing environments. There is an underlying assumption in standard costing that control can be exercised by concentrating on the efficiency of the workforce. Direct labour efficiency standards are seen as a key to management control.

However, in practice, where manufacturing systems are highly automated, the rates of production output and materials consumption, are controlled by the machinery rather than the workforce.

Ideal standard used

Variances are the difference between actual performance and standard, measured in cost terms. The significance of variances for management control purposes depends on the type of standard cost used.

Just in time (JIT) and **total quality management (TQM)** businesses often implement an ideal standard due to the emphasis on continuous improvement and high quality. Therefore, adverse variances with an ideal standard have a different meaning from adverse variances calculated with a current standard.

Emphasis on continuous improvement

Standard costing and adherence to a preset standard is inconsistent with the concept of continuous improvement, which is applied within **TQM** and **JIT** environments.

Detailed information is required

Variance analysis is often carried out on an aggregate basis (total material usage variance, total labour efficiency variance and so on) but in a complex and constantly changing business environment more detailed information is required for effective management control.

Monitoring performance is important

Variance analysis control reports tend to be made available to managers at the end of a reporting period. In the modern business environment managers need more 'real time' information about events as they occur.



Dysfunctional variances in a JIT and TQM environments

Some variances are not useful in JIT or TQM environment, for example:

- (1) **The material price variance:** in a JIT environment, the business is prepared to pay a higher price for materials, as suppliers will consistently deliver raw material with no defects. In a TQM environment, the company is prepared to pay a higher price to acquire better quality material, so that production will 'get it right first time'. Therefore, the material price variance may not be relevant for measuring performance.
- (2) **The labour, variable overhead and fixed overhead efficiency variances:** in a TQM production environment, labour is working toward minimizing waste and improving quality. In a traditional standard costing environment, efficiency variance could be adverse, but would be 'allowed' in a TQM environment as long as the final product meets customers' expectations.
- (3) **The material usage variance:** in a JIT environment, since the workforce needs to be fast in the production process, more wastage could occur. In a TQM environment, the final product sent to customer must be absolutely fault-free, and so more materials might be used as only good quality finished goods are acceptable. Material usage variance might not be useful to assess performance.



Test your understanding 22

Comment on whether standard costing applies in both manufacturing and service businesses and how it may be affected by modern initiatives of continuous performance improvement and cost reduction.

Standard costs and behavioural issues

Standard costs are set with a view to measuring actual performance against the standard, and reporting variances to the managers responsible. The aims of setting standards include:

- setting a target for performance
- motivating the managers responsible to achieve those targets
- holding these managers accountable for actual performance
- perhaps rewarding managers for good performance and criticising them for poor performance.

Managers and employees might respond in different ways to standard setting.

Factors to consider include:

The type of standard set

Individuals might respond to standards in different ways, according to the difficulty of achieving the standard level of performance.

- **Ideal standard:** When a standard level of performance is high, e.g. an ideal standard, employees and their managers will recognise that they cannot achieve it. Since the target is not achievable, they might not even try to get near it.
- **Current standard:** When the standard of performance is not challenging (e.g. a current standard), employees and their managers might be content simply to achieve the standard without trying to improve their performance.
- **Attainable standard:** An attainable standard might be set which challenges employees and their managers to improve their performance. If this attainable standard is realistic, it might provide a target that they try to achieve. Some employees will be motivated by this challenge and will work harder to achieve it. However, some employees may prefer standards to be set at a low level of performance, in order to avoid the need to work harder.
- **Basic standard:** This type of standard may motivate employees since it gives them a long-term target to aim for. However, the standard may become out of date quickly and, as result, may actually demotivate employees.



Standard costs in changing environments

Variance analysis can be unhelpful, and potentially misleading in the modern organisation; this is especially true of JIT and TQM environments. Standard costing is most appropriate in a stable, standardised and repetitive environment. However, modern business environment is rapidly changing, which highlights the following problems with standard costing:

- (1) Standard costing focuses on reducing costs, and ignores quality and customer satisfaction. A high quality output is at the centre of a TQM environment. The cost of failing to achieve the required level of quality is not measured in standard costs and variances, but in terms of internal and external failure costs, neither of which would be identified by a traditional standard costing analysis.
- (2) A standard costing system puts too much emphasis on direct labour costs. However, in the modern business environment, production is largely automated, so direct labour is only a small proportion of costs.
- (3) A standard costing system puts too much emphasis on the control of short-term, variable costs. However, in the modern environment, most costs (including direct labour costs), are fixed costs – or fixed at least in the short term.

- (4) Standard costing is most appropriate in a stable, standardised and repetitive environment; one of the main objectives of standard costing is to ensure that processes conform to standards, that they do not vary, and that variances are eliminated. The modern business environment is dynamic, unstable, more competitive, and operations are more complex – standard costing is not always suitable for it.
- (5) Achieving standards is acceptable is standard costing, when the modern business environment insists more on **continuous improvement**.
- (6) Standard costing systems produce control statements weekly or monthly, but in a dynamic business environment, managers need more prompt control information in order to deal with any changes.

Participation in standard setting

The level of participation in standard setting

Arguments in favour of participation

It could motivate employees to set higher standards for achievement.

Staff are more likely to accept standards that they have been involved in setting.

Morale and actual performance levels might be improved.

Staff will understand more clearly what is expected of them.

Arguments against participation

Senior management might be reluctant to share responsibilities for budgeting.

The standard-setting process could be time consuming.

Staff might want to set standards that they are likely to achieve, rather than more challenging targets. They might try to build some 'slack' into the budget.

The standard-setting process could result in conflicts rather than co-operation and collaboration.

Staff might feel that their suggestions have been ignored.



Test your understanding 23

Which one of the following is not an advantage of participation in standard setting?

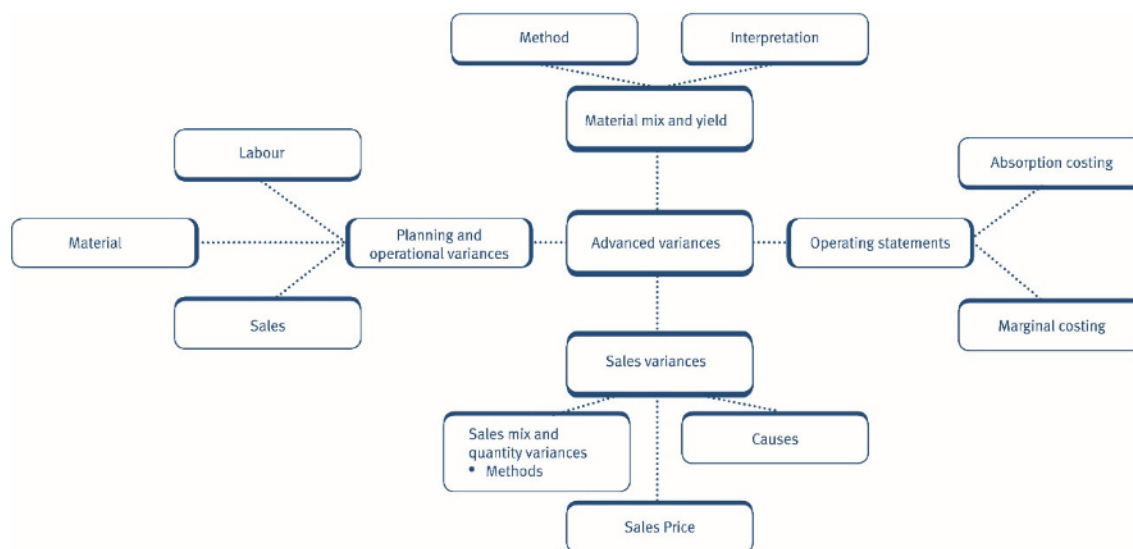
- A The time taken to reach decisions will be quicker via assorted committee meetings.
- B The quality of decisions should improve with collective decision making.
- C There will be improved communication between staff.
- D Staff are more likely to accept standards that they have helped set.

The use of pay as a motivator

If standards are used as a way of encouraging employees to improve their performance, motivation could be provided in the form of higher pay if targets are reached or exceeded.

However, if employees are offered a bonus for achieving standard costs, this could increase their incentive to set low standards of performance, i.e. include 'slack' in the standard cost. Lower standards will increase the probability that the standards will be achieved and a bonus will be earned.

10 Chapter summary



Test your understanding answers



Test your understanding 1 – Sales variances

- (a) Under absorption costing, the variance is calculated using the standard profit per unit.

Using the three line method:

\$

Sales price variance

$$\text{AQ AP} = 6,000 \times \$61 = \$366,000$$

$$\text{Variance} = \text{\$6,000 F}$$

$$\text{AQ SP} = 6,000 \times \$60 = \$360,000$$

Sales volume variance

$$\text{AQ SM} = 6,000 \times \$5 = \$30,000$$

$$\text{Variance} = \text{\$2,500 A}$$

$$\text{BQ SM} = 6,500 \times \$5 = \$32,500$$

Alternative calculations:

$$6,000 \text{ units } \textbf{should} \text{ have sold for } 6,000 \times \$60 = \$360,000$$

$$6,000 \text{ units } \textbf{did} \text{ sell for } 6,000 \times \$61 = \$366,000$$

$$\textbf{Sales price variance} \quad \text{\$6,000 F}$$

$$\text{Budgeted sales} \quad 6,500 \text{ units}$$

$$\text{Actual sales} \quad 6,000 \text{ units}$$

$$\text{Variance in units} \quad 500 \text{ units A}$$

$$\text{@ standard profit \$5} \quad \text{\$2,500 A}$$

- (b) The sales price variance is the same under marginal costing, but the sales volume variance is calculated using the standard contribution per unit. Here, standard contribution = \$60 – (\$25 + \$8 + \$4) = \$23.

Sales volume variance

$$\text{AQ SM} = 6,000 \times \$23 = \$138,000$$

$$\text{Variance} = \text{\$11,500 A}$$

$$\text{BQ SM} = 6,500 \times \$23 = \$149,500$$

Alternative calculation:

Budgeted sales =	6,500
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Actual sales =	6,000
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Variance	500 A
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$$\text{Variance} = 500 \text{ A units} \times \text{standard contribution of } \$23 \text{ per unit} = \text{\$11,500 A}$$



Test your understanding 2 – Materials variances

Using the three line method

\$

Material price variance

$$\text{AQ AP} = \$20,900$$

$$\text{Variance} = \text{\$1,100 F}$$

$$\text{AQ SP} = 2,200 \text{ kgs} \times \$10 = \$22,000$$

Material usage variance

$$\text{AQ SP} = 2,200 \text{ kgs} \times \$10 = \$22,000$$

$$\text{Variance} = \text{\$2,000 A}$$

$$\text{SQ SP} = 1,000 \text{ units} \times 2 \text{ kgs} \times \$10 = \$20,000$$

Alternative calculations:

2,200 kgs should have cost $2,200 \times \$10$	\$22,000
--	----------

2,200 kgs did cost	\$20,900
---------------------------	----------

Materials price variance	\$1,100 F
---------------------------------	------------------

1,000 units of output should have used $1,000 \times 2 \text{ kgs}$	2,000 kgs
---	-----------

1,000 units of output did use	2,200 kgs
-------------------------------	-----------

Therefore variance is adverse by	200 kgs
----------------------------------	---------

@ standard cost per kg \$10	\$2,000 A
-----------------------------	------------------



Test your understanding 3 – Labour variances

Labour rate variance

	\$
Actual hours paid, 15,500 hours, should cost \$4.80 per hour	74,400
Actual hours paid, 15,500 hours, did cost	69,750
Variance	4,650 F

Labour efficiency variance

	Hours
Actual production, 1,000 units, should take 15 hours per unit	15,000
Actual production, 1,000 units, did take	15,500
Variance	500 A

Variance = 500 A hours × **standard cost** of \$4.80 per hour = \$2,400 A

Labour rate variance – three line method

AH AR = \$69,750

Variance = \$4,650 F

AH SR = 15,500 × \$4.80 = \$74,400

Labour efficiency variance – three line method

AH SR = 15,500 × \$4.80 = \$74,400

Var. = \$2,400 A

SH SR = (1,000 × 15 hours) × \$4.80 = \$72,000



Test your understanding 4 – Variable overhead variances

Variable overhead expenditure variance	\$
Actual hours paid, 15,500 hours, should cost \$1 per hour	15,500
Actual hours paid, 15,500 hours, did cost	14,900
Variance	600 F

Variable overhead efficiency variance	Hours
Actual production, 1,000 units, should take 15 hours per unit	15,000
Actual production, 1,000 units, did take	15,500
Variance	500 A

Variance = 500 A hours × **standard cost** of \$1 per hour = \$500 A

Variable overhead expenditure variance – three line method

AH AR = \$14,900

Variance = \$600 F

AH SR = 15,500 × \$1 = \$15,500

Variable overhead efficiency variance – three line method

AH SR = 15,500 × \$1 = \$15,500

Variance = \$500 A

SH SR = (1,000 × 15 hours) × \$1 = \$15,000


Test your understanding 5 – Fixed overhead variances

(a) $\text{FOAR} = \$22,960 \div (6,560 \text{ units} \times 2 \text{ hours per unit}) = \$1.75 \text{ per hour}$

(b) **Fixed overhead expenditure variance**

	\$
Budgeted fixed overhead	22,960
Actual fixed overhead	24,200
Variance	1,240 A

Fixed overhead expenditure variance – three line method

AH AR = \$24,200

Var. = \$1,240 A

BH SR = \$22,960

(c) **Fixed overhead capacity variance**

	Hours
Budgeted hours worked = 2 hours $\times$ 6,560 units	13,120
Actual hours worked	12,600
Variance	520 A

Variance in \$ = 520A hours $\times$ **standard FOAR** \$1.75/hr = \$910 A

Fixed overhead capacity variance – three line method

BH SR = \$22,960

Variance = \$910 A

AH SR = 12,600 $\times$ \$1.75 = \$22,050

(d) **Fixed overhead efficiency variance**

	Hours
Actual production, 6,460 units, should take 2 hours per unit	12,920
Actual production, 6,460 units, did take	12,600
Variance	320 F

Variance in \$ = 320F hours × standard FOAR per hour \$1.75 = \$560 F

Fixed overhead efficiency variance – alternative method

AH SR = 12,600 × \$1.75 = \$22,050

Variance = \$560 F

SH SR = (6,460 × 2) × \$1.75 = \$22,610

(e) **Fixed overhead volume variance**

	Units
Budgeted production	6,560
Actual production	6,460
Variance	100 A

Variance in \$ = 100 A units × **standard hours** of 2 × standard **FOAR** per hour \$1.75 = \$350 A

Fixed overhead volume variance – alternative method

BH SR = \$22,960

Variance = \$350 A

SH SR = (6,460 × 2) × \$1.75 = \$22,610

Note: The fixed overhead volume variance of \$350A is the total of the capacity and efficiency variances (\$910 A + \$560 F).


Test your understanding 6 – AC operating statement

Material A variances:	\$	\$
AQ AP =	91,500	
Price variance	}	1,500 (A)
AQ SP = 7,500 kg × \$12 =	90,000	
Usage variance	}	6,000 (A)
SQ SP = (700 units × 10 kg) × \$12 =	84,000	
Material B variances:	\$	\$
AQ AP =	20,300	
Price variance	}	2,800 (A)
AQ SP = 3,500 kg × \$5 =	17,500	
Usage variance	}	3,500 (F)
SQ SP = (700 units × 6 kg) × \$5 =	21,000	
Labour variances:	\$	\$
AH AR =	27,880	
Rate variance	}	680 (A)
AH SR = 3,400 hours × \$8 =	27,200	
Efficiency variance	}	800 (F)
SH SR = (700 units × 5 hours) × \$8 =	28,000	
Fixed overhead variances:	\$	\$
AH AR =	37,000	
Expenditure variance	}	8,000 (F)
BH SR = 750 units × \$60 per unit	45,000	
Volume variance	}	3,000 (A)
SH SR = 700 units × \$60 per unit		
Sales variances:	\$	\$
AQ AP	224,000	
Price variance	}	14,000 (F)
AQ SP = 700 units × \$300 per unit	210,000	
AQ SM = 700 units × \$50 per unit	35,000	
Volume variance	}	2,500 (A)
BQ SM = 750 units × \$50 per unit	37,500	

Operating statement

			\$
Budgeted profit ($750 \times \$50$)			37,500
Sales volume variance			(2,500)
Standard profit on actual sales			35,000
Selling price variance			14,000
Cost variances:	F	A	
Material price (combined)		(4,300)	
Material usage (combined)		(2,500)	
Labour rate		(680)	
Labour efficiency	800		
Fixed overhead expenditure	8,000		
Fixed overhead volume		(3,000)	
Total	8,800	10,480	(1,680)
Actual profit			47,320

**Test your understanding 7 – MC operating statement**

Standard contribution = $\$6 - \$4.30 = \$1.70$ per cylinder

Sales variances:	\$	\$
AQ AP	63,000	
Price variance		} 600 (A)
AQ SP = 10,600 units $\times$ \$6 per unit	63,600	
AQ SM = 10,600 units $\times$ \$1.70 per unit	18,020	
Volume variance		} 1,020 (F)
BQ SM = 10,000 units $\times$ \$1.70 per unit	17,000	

Material variances:	\$	\$
AQ AP =	42,500	
Price variance		} 60 (F)
AQ SP = 53,200 kg × \$0.80 =	42,560	
Usage variance		} 160 (A)
SQ SP = (10,600 units × 5 kg) × \$0.80 =	42,400	
Labour variances:	\$	\$
AQ AP =	3,100	
Rate variance		} 40 (A)
AH SR = 2,040 hours × \$1.50 =	3,060	
Efficiency variance		} 120 (F)
SH SR = (10,600 units × 0.2 hours) × \$1.50 =	3,180	
Operating statement		\$
Budgeted contribution (10,000 × \$1.70)		17,000
Sales volume contribution variance		1,020 F
Standard contribution on actual sales (10,600 × 1.70)		18,020
Sales price variance		(600 A)
Variable cost variances:	F	A
	\$	\$
Materials price	60	
Wages rate		40
Materials usage		160
Labour efficiency	120	
	180	200 (20 A)
Actual contribution		17,400
Budgeted fixed overhead		2,000
Fixed overhead expenditure variance		(200 A)
Actual profit		15,200



Test your understanding 8 – Material mix

Material mix variance

Material	Std mix	Actual Material usage (kgs)	Actual usage @ std mix (kgs)	Mix Variance (kgs)	Std cost per kg (\$)	Mix variance (\$)
A	600/1200	14,000	12,500	1,500 A	1.10	1,650 A
B	240/1200	5,500	5,000	500 A	2.40	1,200 A
C	360/1200	5,500	7,500	2,000 F	1.50	3,000 F
		25,000	25,000	0	–	150 F

Comment

The favourable mix variance is due to more of materials A and B being used in place of material C.



Test your understanding 9 – Material yield

(1)	Total input of 25,000 kgs should produce (÷ 1.2 kgs per unit)	20,833 units of output
(2)	25,000 kgs did produce	21,000 units of output
(3)	Difference = yield variance in units	167 units F
(4)	Value at the standard cost of (Working)	\$1.78 per unit
(5)	Yield variance	\$297 F

Working

Standard cost per unit = $((600 \times \$1.10) + (240 \times \$2.40) + (360 \times \$1.50)) \div 1,000 \text{ units} = \$1.78 \text{ per unit}$

Comment

The favourable variance is due to more output being achieved than was expected from the materials input.



Test your understanding 10 – Material mix and yield

Material A usage variance

$$AQ\ SP = 1,000 \times \$4 = \$4,000$$

$$\text{Variance} = \$2,400\ F$$

$$SQ\ SP = (160\ \text{units} \times 10\ \text{kg/unit}) \times \$4 = \$6,400$$

Material B usage variance

$$AQ\ SP = 1,460 \times \$6 = \$8,760$$

$$\text{Var.} = \$10,440\ F$$

$$SQ\ SP = (160\ \text{units} \times 20\ \text{kg/unit}) \times \$6 = \$19,200$$

$$\text{Total usage variance} = \$2,400 + \$10,440 = \$12,840$$

Material mix variance

Material	Std mix	Actual Material usage (kgs)	Actual usage @ std mix (kgs)	Mix Variance (kgs)	Std cost per kg (\$)	Mix variance (\$)
A	10/30	1,000	820	180 A	4	720 A
B	20/30	1,460	1,640	180 F	6	1,080 F
		<u>2,460</u>	<u>2,460</u>	<u>0</u>	<u>–</u>	<u>360 F</u>

Material yield variance

Material	Actual usage @ std mix (kgs)	Std usage for actual output (kgs)	Yield variance (kgs)	Std cost per kg (\$)	Yield variance (\$)
A	820	$160 \times 10\ \text{kg} = 1,600$	780 F	4	3,120 F
B	1,640	$160 \times 20\ \text{kg} = 3,200$	1,560 F	6	9,360 F
	<u>2,460</u>	<u>4,800</u>	<u>2,340 F</u>	<u>–</u>	<u>12,480 F</u>

Alternatively, the material yield variance can be calculated in total using the following method:

(1)	Total input = 1,000 kgs + 1,460 kgs = 2,460 kgs	
	This should produce (+ 30 kgs)	82 units of output
(2)	2,460 kgs did produce	160 units of output
(3)	Difference = yield variance in units	78 units F
(4)	Value at the standard cost of	\$160 per unit
(5)	Yield variance	\$12,480 F

Total mix and yield variance = \$12,480 F + \$360 F = \$12,840 F (as per the usage variance).



Test your understanding 11 – Mix and yield with material waste

Material mix variance

The material mix variance is not affected by the material wastage and should be calculated in the normal way:

Material	Std mix	Actual Material usage (kgs)	Actual usage @ std mix (kgs)	Mix Variance (kgs)	Std cost per kg (\$)	Mix variance (\$)
S1	8/16	8,284	9,576.5	1,292.5 F	0.30	387.75 F
S2	5/16	7,535	5,985.3	1,549.7 A	0.50	774.85 A
S3	3/16	3,334	3,591.2	257.2 F	0.40	102.88 F
		19,153	19,153	0	–	284.22 A

Material yield variance

The yield variance will take account of the material wastage of 10%:

Material	Std usage for actual output (kgs)	Actual usage @ std mix (kgs)	Yield variance (kgs)	Std cost per kg (\$)	Yield variance (\$)
S1	8/16 = 8,560	9,576.5	1,016.5 A	0.30	304.95 A
S2	5/16 = 5,350	5,985.3	635.3 A	0.50	317.65 A
S3	3/16 = 3,210	3,591.2	381.2 A	0.40	152.48 A
	15,408 × 100/90 = 17,120	19,153	2,033 A	–	775.08 A

Material usage variance

Total usage variance = \$775.08 A + \$284.22 A = \$1,059.3 A



Test your understanding 12

In a performance measurement system managers are often rewarded for improving the performance of cost and/or revenues under their control.

The production manager may be responsible for the material mix decision and, if the reward system is based on achieving cost savings, then the cheapest mix may be used. This may have a detrimental effect on company profit if quality is reduced and this leads to a lower price or quality failure costs.

It may therefore be preferable to reward managers on the basis of total company profit so that the full impact of the mix decision is taken into account.


Test your understanding 13 – Sales mix and quantity variances
(i) Sales mix contribution variance:

	Standard Mix (units)	Actual Quantity, Actual Mix (units)	Actual Quantity, Standard Mix (units)	Difference (units)	@ standard cont'n per unit	Variance
S	8,000	9,500	8,200	1,300 F	\$5/unit	\$6,500 F
T	12,000	11,000	12,300	1,300 A	\$6/unit	\$7,800 A
	20,000	20,500	20,500			\$1,300 A

(ii) Sales quantity contribution variance:

	Actual Quantity, Standard Mix (units)	Budgeted Quantity, Standard Mix (units)	Difference (units)	@ standard cont'n per unit	Variance
S	8,200	8,000	200 F	\$5/unit	\$1,000 F
T	12,300	12,000	300 F	\$6/unit	\$1,800 F
					\$2,800 F

Alternative method:

Actual total quantity	20,500 units
Budgeted total quantity	20,000 units
Difference	500 units F
@ Standard weighted average margin (5 × 8,000 + 6 × 12,000)/(20,000)	\$5.60/unit
Variance	\$2,800 F


Test your understanding 14 – Sales mix and quantity variances
Working 1: OAR

$$\text{OAR} = \frac{\$81,000}{3,000 + 7,800 + 7,200}$$

so OAR = \$4.50 per machine hour

Working 2: Standard profit

	B	R	K
Materials	\$5.40	\$4.10	\$4.85
Labour	\$3.25	\$5.20	\$4.55
Overheads	\$1.35	\$2.70	\$3.60
Total cost	\$10	\$12.00	\$13.00
Selling price	\$14	\$15.00	\$18.00
Standard profit	\$4.00	\$3.00	\$5.00

Working 3: Weighted average standard profit

	B	R	K
Standard profit	\$4.00	\$3.00	\$5.00

$$\text{W.A. standards profit} = \frac{(\$4 \times 10,000 \text{ units}) + (\$3.00 \times 13,000 \text{ units}) + (\$5 \times 9,000 \text{ units})}{32,000 \text{ budgeted units}}$$

$$= \$3.875$$

(i) Sales price variance:

	B	R	K
Actual selling price per unit	\$14.50	\$15.50	\$19.00
Standard selling price per unit	\$14.00	\$15.00	\$18.00
Variance	\$0.50 F	\$0.50 F	\$1.00 F
	× 9,500 units	× 13,500 units	× 8,500 units
Total variance	\$4,750 F	\$6,750 F	\$8,500 F

Therefore, total sales price variance = \$4,750 F + \$6,750 F + \$8,500 F = **\$20,000 F**

(ii) **Sales volume profit variance:**

	B	R	K
Expected volumes	10,000 units	13,000 units	9,000 units
Actual volumes	9,500 units	13,500 units	8,500 units
Variance	500 units A	500 units F	500 units A
× standard profit	\$4.00	\$3.00	\$5.00
Total variance	\$2,000 A	\$1,500F	\$2,500 A

Therefore, total sales volume profit variance = \$2,000 A + \$1,500 F + \$2,500 A = **\$3,000 A**

(iii) **Sales mix profit variance:**

	Standard Mix	Standard Mix, Actual Quantity	Actual Mix, Actual Quantity	Difference	@ standard profit	Variance
B	10,000 units	9,843.75	9,500 units	343.75 A	\$4	\$1,375 A
R	13,000 units	12,796.875	13,500 units	703.125 F	\$3	\$2,109.37 F
K	9,000 units	8,859.375	8,500 units A	359.375 A	\$5	\$1,796.87 A
	32,000	31,500	31,500			\$1,062.5 A

Alternative method:

	Standard Profit per unit	Weighted Average profit per unit	Difference	Difference actual sales/ budgeted sales	Variance
B	\$4	\$3.875	\$0.125	(500 units)	\$62.50 A
R	\$3	\$3.875	\$(0.875)	500 units	\$437.50 A
K	\$5	\$3.875	\$1.125	(500 units)	\$562.50 A
					\$1,062.5 A

(iv) **Sales quantity profit variance:**

	Standard Mix Actual Quantity	Budgeted sales	Difference	Standard profit per unit	Variance
B	9,843.75	10,000	156.25 A	\$4	\$625.00 A
R	12,796.875	13,000	203.125 A	\$3	\$609.375 A
K	8,859.375	9,000	140.625 A	\$5	\$703.125 A
					\$1,937.50 A

Alternative method:

Budgeted total quantity			32,000 units
Actual total quantity	=		31,500 units
Variance			500 units Adverse

500 units adverse @ standard profit \$3.875 = \$1,937.5 Adverse

**Test your understanding 15 – Market size and share**

(a) Traditional sales volume variance

$$= (\text{Actual units sold} - \text{Budgeted sales}) \times \text{Standard profit per unit}$$

$$= (450,000 - 400,000) \times \$3 = \$150,000 \text{ F}$$

(b) Planning and operational variances The revised (ex-post) budget would show that Hudson Ltd should expect to sell 20% of 2.2 million units = 440,000 units.

$$\text{Original sales} \times \text{standard margin} = 400,000 \times \$3 = \$1,200,000$$

$$\text{Market size} = \$120,000 \text{ F}$$

$$\text{Revised sales} \times \text{standard margin} = 440,000 \times \$3 = \$1,320,000$$

$$\text{Market share} = \$30,000 \text{ F}$$

$$\text{Actual sales} \times \text{standard margin} = 450,000 \times \$3 = \$1,350,000$$

$$\text{Total sales volume variance} = \$120,000 \text{ F} + \$30,000 \text{ F} = \$150,000 \text{ F}$$

Comment:

Most of the favourable variance can be attributed to the increase in overall market size. However, some can be put down to effort by the sales force which has increased its share from 20% to 20.5% (450,000/2,200,000).

Managers should only be appraised on the operational variance, i.e. the market share variance.



Test your understanding 16 – Additional example

- (a) Sales price variance
 $= 220,000 \times (\$14 - \$12.50) = \$330,000 \text{ A}$
 Sales volume variance
 $= (250,000 - 220,000) \times \$4 = \$120,000 \text{ A}$
- (b) Budgeted market share $= 250,000/1,000,000 = 25\%$
 The company would have expected to achieve sales of $25\% \times 1,100,000 = 275,000$ in the actual market conditions.
 The market size variance
 $= (275,000 - 250,000) \times \$4 = \$100,000 \text{ F}$
 The market share variance
 $= (275,000 - 220,000) \times \$4 = \$220,000 \text{ A}$
 The increased market size is favourable as the company should sell more if market share can be maintained. The market share variance was adverse as market share fell from 25% to $220,000/1,100,000 = 20\%$.
- (c) It could be argued that the increased competition in the market was not foreseen when the budget was set and the variance is thus a planning variance. However, this line of reasoning would suggest that any unforeseen issues give rise just to planning variances. Perhaps sales managers should have identified potential threats sooner? Also, once extra competition was experienced, managers had to decide how to respond. This could have involved additional advertising rather than price cuts, e.g. it could be argued that price cuts were made to try (unsuccessfully) to protect market share, in which case managers should be held (at least partly) responsible for such a decision.


Test your understanding 17 – The Alpha Company

(1) **D**

	AQSM	BQSM	Difference	Standard profit per unit	Variance (\$)
A	440	400	40 F	\$8	320 F
B	660	600	600 F	\$6	360 F
C	1,100	1,000	100 F	\$4	400 F
	2,200	2,000	200 F		1,080 F

(2) **A**

Statement (3) is not correct: managers can only be appraised on what they can control, i.e. on the operational variances for sales.

(3) **B**

Statement (1) is not correct; this would cause a favourable variance, not an adverse variance.

(4) **C**

Original budgeted sales 600 units × standard profit \$6	\$3,600
Revised budgeted sales 600 units × (1–10%) = 540 units, @ \$6	\$3,240
Planning variance (market size variance)	\$360 A

(5) **D**

Revised budgeted sales 600 units × (1–10%) = 540 units, @ \$6	\$3,240
Actual sales quantity 700 units × standard profit \$6	\$4,200
Operational variance (market share variance)	\$960 F



Test your understanding 18 – Price variances

$$AQ \times AP: 10,000 \times \$5.18 = \$51,800$$

> Operational variance \$1,800 adverse

$$AQ \times RSP: 10,000 \times \$5.00 = \$50,000$$

> Planning variance \$2,000 favourable

$$AQ \times SP: 10,000 \times \$5.20 = \$52,000$$

Operational variance: The cost per unit was higher than the revised budgeted cost resulting in the adverse variance. This variance is controllable by management and should be linked to their performance evaluation.

Planning variance: The improvement in technology resulted in a lower price per unit and hence a favourable variance. This is a planning difference and is therefore uncontrollable by management.

A traditional variance calculation would present as follows:

$$AQ \times AP : 10,000 \times \$5.18 = \$51,800$$

> Price variance \$200 Favourable

$$AQ \times SP : 10,000 \times \$5.20 = \$52,000$$



Test your understanding 19 – Price and usage variances

(a) Traditional variances

AQAP =	\$41,500	
	Price variance	\$2,500 F
AQSP = 11,000 × \$4 =	\$44,000	
	Usage variance	\$4,800 A
SQSP = 1,400 × 7 × \$4 =	\$39,200	

(b) Planning and operational variances

Price

AQ × AP	= \$41,500	
	Operational variance	\$300 F
AQ × RSP 11,000 × \$3.80 =	\$41,800	
	Planning variance	\$2,200 F
AQ × SP 11,000 × \$4 =	\$44,000	
		\$2,500 F

Usage			
AQ × SP	11,000 × \$4	= \$44,000	
		Operational variance	\$800 F
RSQ × SP	11,200 × \$4	= \$44,800	
		Planning variance	\$5,600 A
SQ × SP	9,800 × \$4	= \$39,200	
			\$4,800 A



Test your understanding 20

AH × SR	1,450 × \$10	= \$14,500	
		Operational variance	\$500 F
RSH × SR	1,500 × \$10	= \$15,000	
		Planning variance	\$2,500 A
SH × SR	1,250 × \$10	= \$12,500	
			\$2,000 A



Test your understanding 21 – Learning curves and variances

The '8 hours' original standard does not take into account the presence of a learning curve effect, that affects the first 600 units. By the time we reach 560 units of production, we have an average time per unit of 3.0574 hours:

$$Y = 8 \text{ hours} \times 560 \text{ units}^{-0.1520}$$

Y = 3.0574 hours on average per unit (revised standard).

Therefore, the first 560 units should have taken:

8 hours per unit × 560 units = 4,480 hours using the original, old standard labour hours per unit, and

3.0574 hours per unit × 560 units = 1,712 hours, using the revised standard labour hours per unit.

This is a favourable difference of 2,768 hours and therefore the planning variance for labour efficiency may be calculated as 2,768 hours × \$15 = \$41,520 Favourable.

To calculate the operational variance, we compare the standard number of labour hours for actual production (1,712 hours, using the revised standard) and the actual time of 3,500 hours, giving 1,788 hours ADV × \$15 = \$26,820 ADV.



Test your understanding 22

Standard costing is most suited to organisations whose activities consist of a series of common or repetitive operations. Typically, mass production manufacturing operations are indicative of its area of application. It is also possible to envisage operations within the service sector to which standard costing may apply, though this may not be with the same degree of accuracy of standards which apply in manufacturing. For example, hotels and restaurants often use standard recipes for preparing food, so dealing with conference attendance can be like a mass production environment. Similarly, banks will have common processes for dealing with customer transactions, processing cheques, etc. It is possible therefore that the principles of standard costing may be extended to service industries.

In modern manufacturing and service businesses, continuous improvement and cost reduction are topical. In order to remain competitive it is essential that businesses address the cost levels of their various operations. To do this they have to deal with the costing of operations. But the drive to 'cost down' may mean in some cases that standards do not apply for long before a redesign or improvement renders them out of date. In such a setting an alternative to the use of standard costs is to compare actual costs with those of the previous operating period. We have seen above that a standard costing system has a variety of purposes. It is for management to judge their various reasons for employing standard costing and, consequently, whether their aims of continuous improvement and cost reduction render the system redundant.



Test your understanding 23

A is the correct answer.

Greater participation by staff in standard setting is likely to slow down the process of agreeing values.

Performance measurement and control

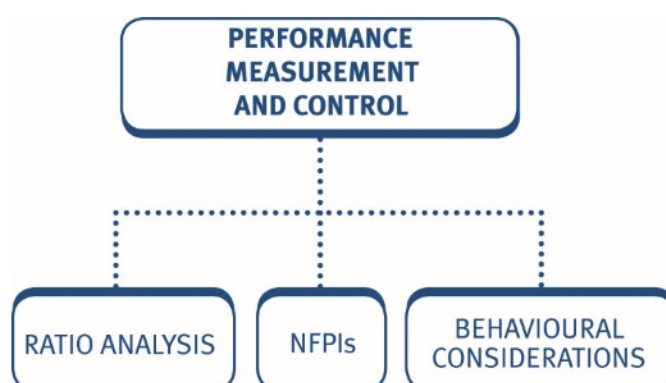
Chapter learning objectives

Upon completion of this chapter you will be able to:

- Describe, calculate and interpret suitable financial performance indicators (FPIs) for profitability, liquidity, efficiency and gearing.
- Describe, calculate and interpret suitable non-financial performance indicators (NFPIs).
- Analyse past performance and suggest ways for improving financial and non-financial performance.
- Explain the causes and problems created by short-termism and financial manipulation of results.
- Discuss the issues organisations face by favouring short-term financial gain over long-term sustainability.
- Explain and interpret the Balanced Scorecard, and the Building Block model proposed by Fitzgerald and Moon.
- Discuss the difficulties of target setting in qualitative areas.
- Explain the need to allow for external considerations in performance management, including stakeholders, market conditions and allowance for competitors.
- Interpret performance in the light of external considerations and the need to consider sustainability.



One of the PER performance objectives (PO14) is to measure and assess departmental and business performance. Working through this chapter should help you understand how to demonstrate that objective.



1 Introduction

The calculation of a particular indicator of performance will probably mean very little, unless it is set in some context. Establishing the value of a particular indicator will add little benefit until it is:

- (1) compared with a budget
- (2) set in a trend
- (3) and/or set against a best practice benchmark.

2 Financial performance and ratio analysis

A key aspect of performance measurement is ratio analysis. Specific ratios are discussed below but some general considerations need to be taken into account with all ratio analysis:

- Many ratios use figures at a particular point in time and thus may not be representative of the position throughout a period. For example, seasonal trade or large one-off items may make year-end figures uncharacteristic.
- Ratios are of little use in isolation. Comparisons could be made to:
 - last year's figures to identify trends
 - competitors' results and/or industry averages to assess performance.
- Ratios can be manipulated by management. A well-known example of 'window dressing' is to issue spurious invoices before the year end and then issue credit notes just after.
- As with variances, ratios indicate areas for further investigation, rather than giving a definitive answer for management.
- Three main classes of ratios will be reviewed
 - Profitability
 - Liquidity
 - Gearing/risk.



Measuring profitability

The primary objective of a company is to maximise profitability. Profitability ratios can be used to monitor the achievement of this objective.

Gross profit margin

This is the gross profit as a percentage of turnover.

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Turnover}} \times 100$$

A high gross profit margin is desirable. It indicates that either sales prices are high or that production costs are being kept well under control.

Operating profit margin

This is the operating profit (turnover less all expenses) as a percentage of turnover.

$$\text{Operating profit margin} = \frac{\text{Operating profit}}{\text{Turnover}} \times 100$$

A high operating profit margin is desirable. It indicates that either sales prices are high or that all costs are being kept well under control.

Return on capital employed (ROCE)

This is a key measure of profitability. It is the operating profit as a percentage of the capital employed. The ROCE shows the operating profit that is generated from each \$1 of assets employed.

$$\text{ROCE} = \frac{\text{Operating profit}}{\text{Capital employed}} \times 100$$

Where capital employed = total assets less current liabilities or total equity plus long-term debt.

If operating profit (profit before finance charges and tax) is not given in the question, use net profit instead.

A high ROCE is desirable. An increase in ROCE could be achieved by:

- Increasing operating profit, e.g. through an increase in sales price or through better control of costs.
- Reducing capital employed, e.g. through the repayment of long term debt.

The ROCE can be understood further by calculating the operating profit margin (operating profit/sales × 100) and the asset turnover (see below):

$$\text{ROCE} = \text{operating profit margin} \times \text{asset turnover}$$



Measuring efficiency

Asset turnover

This is the turnover divided by the capital employed. The asset turnover shows the turnover that is generated from each \$1 of assets employed.

$$\text{Asset turnover} = \frac{\text{Turnover}}{\text{Capital employed}}$$

A high asset turnover is desirable. An increase in the asset turnover could be achieved by:

- Increasing turnover, e.g. through the launch of new products or a successful advertising campaign.
- Reducing capital employed, e.g. through the repayment of long term debt.



Test your understanding 1 – Profitability and efficiency ratios

The following figures are extracted from the accounts of Super Soups, a company selling gourmet homemade soups.

	20X9	20X8
	\$	\$
Total production costs	6,538,000	5,082,000
Gross profit	3,006,000	2,582,000
Operating profit	590,000	574,000
Total capital employed	6,011,000	5,722,000

Required:

Using appropriate ratios, comment on the profitability and efficiency of Super Soups.



Additional example on profitability ratios

Companies X and Y are both involved in retailing. Relevant information for the year ended 30 September 20X5 was as follows:

	X	Y
	\$000	\$000
Sales revenue	50,000	200,000
Profit before tax	10,000	10,000
Capital employed	50,000	50,000

Required:

Prepare the following ratios for both companies and comment on the results:

- (a) ROCE
- (b) profit margin
- (c) asset turnover.

Solution

	X		Y	
ROCE	$\frac{10,000}{50,000}$	$\times 100\%$	$\frac{10,000}{50,000}$	$\times 100\%$
	$= 20\%$		$= 20\%$	
Profit margin	$\frac{10,000}{50,000}$	$\times 100\%$	$\frac{10,000}{200,000}$	$\times 100\%$
	$= 20\%$		$= 5\%$	
Asset turnover	$\frac{50,000}{50,000}$		$\frac{200,000}{50,000}$	
	$= 1$		$= 4$	

The ROCE for both companies is the same. X has a higher profit margin, whilst Y shows a more efficient use of assets. This indicates that there may be a trade-off between profit margin and asset turnover.

Inventory holding period

$$\text{Inventory holding period} = \frac{\text{Inventory}}{\text{Cost of sales}} \times 365$$

This indicates the average number of days that inventory items are held for.

An increase in the inventory holding period could indicate that the company is having problems selling its products and could also indicate that there is an increased level of obsolete inventory. The company should take steps to increase inventory turnover, e.g. by removing any slow moving or unpopular items of inventory and by getting rid of any obsolete inventory.

A decrease in the inventory holding period could be desirable as the company's ability to turn over inventory has improved and the company does not have excess cash tied up in inventory. However, any reductions should be reviewed further as the company may be struggling to manage its liquidity and may not have the cash available to hold the optimum level of inventory.

Receivables (debtor) collection period

$$\text{Receivables collection period} = \frac{\text{Receivables}}{\text{Credit sales}} \times 365$$

This is the average period it takes for a company's debtors to pay what they owe.

An increase in the receivables collection period could indicate that the company is struggling to manage its debts. Possible steps to reduce the ratio include:

- Credit checks on customers to ensure that they will pay on time
- Improved credit control, e.g. invoicing on time, chasing up bad debts.

A decrease in the receivables collection period may indicate that the company's has improved its management of receivables. However, a receivables collection period well below the industry average may make the company uncompetitive and profitability could be impacted as a result.

Payables (creditor) payment period

$$\text{Payables payment period} = \frac{\text{Payables}}{\text{Credit Purchases}} \times 365$$

This is the average period it takes for a company to pay for its purchases. If credit purchases are not available, 'purchases' or 'cost of sales' should be used.

An increase in the company's payables payment period could indicate that the company is struggling to pay its debts as they fall due. However, it could simply indicate that the company is taking better advantage of any credit period offered to them.

A decrease in the company's payables payment period could indicate that the company's ability to pay for its purchases on time is improving. However, the company should not pay for its purchases too early since supplier credit is a useful source of finance.



Measuring liquidity

A company can be profitable but at the same time encounter cash flow problems. Liquidity and working capital ratios give some indication of the company's liquidity.

Current ratio

This is the current assets divided by the current liabilities.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

The ratio measures the company's ability to meet its short term liabilities as they fall due.

A ratio in excess of 1 is desirable but the expected ratio varies between the type of industry.

A decrease in the ratio year on year or a figure that is below the industry average could indicate that the company has liquidity problems. The company should take steps to improve liquidity, e.g. by paying creditors as they fall due or by better management of receivables in order to reduce the level of bad debts.

Quick ratio (acid test)

This is similar to the current ratio but inventory is removed from the current assets due to its poor liquidity in the short term.

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}}$$

The comments are the same as for the current ratio.



Test your understanding 2 – Efficiency and liquidity ratios

Calculate the efficiency and liquidity ratios for P for the year ended 31 December 20X9.

	\$m
Sales revenue	1,867.5
Gross profit	489.3
Inventory	147.9
Trade receivables	393.4
Trade payables	275.1
Cash	53.8
Short-term investments	6.2
Other current liabilities	284.3



Measuring gearing/risk

In addition to managing profitability and liquidity it is also important to manage risk. The following ratios may be calculated:

Operating gearing

Operating gearing is a measure of the extent to which a firm's operating costs are fixed rather than variable as this affects the level of business risk in the firm. Operating gearing can be measured in a number of different ways, including:

$$\frac{\text{Fixed costs}}{\text{Variable costs}} \text{ or } \frac{\text{Fixed costs}}{\text{Total costs}} \text{ or } \frac{\% \text{ change in EBIT}}{\% \text{ change in revenue}} \text{ or } \frac{\text{contribution}}{\text{EBIT}}$$

Firms with a high proportion of fixed costs in their cost structures are known as having 'high operating gearing'.

Financial gearing

This is the long term debt as a percentage of equity.

$$\text{Gearing} = \frac{\text{Debt}}{\text{Equity}} \times 100 \text{ or } = \frac{\text{Debt}}{\text{Debt} + \text{Equity}} \times 100$$

Debt includes any long term debt, bank overdraft (net of any cash balance), and preferences shares. Equity includes the issued ordinary share capital, share premium, and reserves of the company (e.g. retained earnings).

A high level of gearing indicates that the company relies heavily on debt to finance its long term needs. This increases the level of risk for the business since interest and capital repayments must be made on debt, where as there is no obligation to make payments to equity.

The ratio could be improved by reducing the level of long term debt and raising long term finance using equity.

Interest cover

This is the operating profit (profit before finance charges and tax) divided by the finance cost.

$$\text{Interest cover} = \frac{\text{Operating profit}}{\text{Finance cost}}$$

A decrease in the interest cover indicates that the company is facing an increased risk of not being able to meet its finance payments as they fall due.

The ratio could be improved by taking steps to increase the operating profit, e.g. through better management of costs, or by reducing finance costs through reducing the level of debt.

Dividend cover

This is the net profit available to ordinary shareholders (profit after tax and preference dividends) divided by the dividend.

$$\text{Dividend cover} = \frac{\text{Net profit}}{\text{Dividend}}$$

A decrease in the dividend cover indicates that the company is facing an increased risk of not being able to make its dividend payments to shareholders.



Ratio analysis – Additional example

You are employed in the small business section of a medium-sized bank. Some time ago the bank provided a local manufacturing company, F, with an overdraft facility of \$3,000,000. This limit was reached on 30 September 20X4 but was increased then to \$5,000,000.

Your section head has just received the financial statements of F for the six months to 30 September 20X5. Having read these statements, your section head is extremely concerned as to the performance of the company over the last year and is considering recommending the termination of the overdraft facility. Before making any further decision, your section head wishes to have a second opinion. Accordingly, they leave a file of information concerning F on your desk and requires a report recommending the best course of action.

Information contained in the file:

Item 1: Statement of Profit or Loss:

	Six months to 30 September 20X5	Six months to 31 March 20X5
	\$000	\$000
Sales	10,000	11,000
Cost of sales	(5,000)	(5,500)
Gross profit	5,000	5,500
Other operating expenses	(5,000)	(4,500)
Operating profit	–	1,000
Interest payable	(1,000)	(900)
Profit/(loss) before tax	(1,000)	100
Tax estimate	–	–
Profit/(loss) after tax	(1,000)	100

Item 2: Statements of Financial Position at 30 September

	20X5	20X4
	\$000	\$000
Non-current assets:		
Property	5,000	5,200
Plant	3,500	3,000
	8,500	8,200
Current assets:		
Inventories	3,000	2,600
Receivables	5,000	4,600
Cash in hand	80	80
	8,080	7,280
Current liabilities:		
Trade payables	2,600	2,600
Bank overdraft	5,000	3,000
	7,600	5,600
Net current assets	480	1,680
12% loan notes (secured against the property)	(4,800)	(4,800)
	4,180	5,080
Share capital (\$1 shares)	4,000	4,000
Retained earnings	180	1,080
	4,180	5,080

Item 3: Estimated realisable values of the assets of F at 30 September 20X5, based on a 'forced sale' scenario:

	\$000
Property	5,000
Plant	1,000
Inventories	800
Receivables	2,500
	9,300

- (a) Using the items contained in the file, write a report to your section head which contains an appraisal of the performance and financial position of F and considers the implications for the bank of calling in the overdraft.
- (b) Produce a short appendix to the report you have compiled in (a). This should summarise the limitations of the information available to you as a basis for making a recommendation as to the wisdom or otherwise of calling in the overdraft.
- (c) Discuss THREE key areas, with recommendations, that the management of F need to address to improve performance.

Solution

REPORT

To: Section head

From: Bank accountant

Subject: F

Date: 22 November 20X5

- (a) The performance of F appears to have deteriorated in the six months to 30 September 20X5. Sales and cost of sales have both fallen by 9%, so that the gross profit percentage of 50% has been maintained. However, operating expenses have increased, so that total operating costs equal operating income. There is no longer any cover for interest payments. The interest charge has also increased, following the increase in the overdraft facility.

Despite this deterioration in performance, non-current assets and current assets have increased. The additional \$2 million provided by the bank (an increase in overdraft of 66%) appears to have been used to finance the purchase of plant at a cost of approximately \$500,000 (the figure represents the change shown by the statement of financial position and is net of depreciation). The additional depreciation has probably contributed to the increase in operating expenses.

The retained loss for the year is \$900,000 but the actual cash outflow from operating activities is much greater than this. Roughly:

	\$000
Loss	900
Less depreciation (buildings only)	(200)
Increase in inventories	400
Increase in receivables	400
	1,500

The company's financial position has deteriorated during the year. At 30 September 20X5 it had a current ratio of 1.06:1 and a quick ratio of 0.67:1 (compared with 1.3:1 and 0.83:1 at 30 September 20X4). The company is likely to experience severe liquidity problems in the near future.

The company's gearing also gives cause for concern. The company is very dependent upon finance from outside the business. The most recent balance sheet shows a debt to equity ratio of $(5,000 + 4,800)/4,180 = 2.34$. Interest on the loan notes amounts to \$576,000 annually. At current activity levels, this means that there is very little profit available for distribution or investment and very little interest cover. The loan notes are barely covered by the property on which they are secured.

The combination of adverse cash flow, increase in non-current assets and working capital and fall in profits seems to suggest bad management. However, it is impossible to reach a firm conclusion without further information.

The withdrawal of the overdraft facility would result in the liquidation of the company. It is estimated that the assets would realise \$9,300,000. The loan note holders would be repaid their \$4,800,000 in full, leaving a balance of \$4,500,000 for the other creditors. This does not cover the \$7,600,000 owed to the bank and the other creditors. Assuming that all unsecured creditors would rank equally, the bank would receive 59c in the dollar or \$2,950,000. The bank would make a loss of \$2,050,000.

These calculations show that the bank is facing considerable risk. If the overdraft facility is to be continued, the bank should consider renegotiating the terms in order to take account of this risk.

(b) **Appendix**

Only limited information is available as a basis for making this decision.

One major shortcoming of conventional financial statements is that they are based on historical information. They give a good indication of the financial position at 30 September 20X5, but some time has already elapsed since that date. During that time the position could have changed dramatically. For example, the company could have won substantial new business, or receivables could have been realised, or inventory could have been sold. Financial statements are only of limited use in predicting the future of a company.

To make an informed decision, the bank would need information about several other factors which are not reflected in the financial statements. The velocity of circulation of working capital, the quality of the company's management and its ability to attract new business will all be crucial in determining whether or not F survives. For example, the decision to invest in additional plant and to increase inventory levels might have been taken as a result of several new orders. The bank would also need to assess the willingness of the loan note holders and other creditors to continue to support the company. For example, there is no information as to how soon the loan notes will become repayable or as to the means by which the company intends to repay the loan.

- (c) Key areas the management of F need to address include:

Sales performance

Management need to investigate why sales have fallen and the extent to which this is a volume fall or/and a price drop. Based on the competitive/strategic reasons for the fall, the management can then take appropriate action. For example, given margins have remained constant it looks like the issue is one of lost customers. If research reveals that this is due to rivals' price cuts, then F will have to consider whether to respond with similar cuts to remain competitive.

Liquidity and efficiency

The pressure on the overdraft, together with worsening quick and current ratios indicate that urgent action is required to improve working capital management. Both inventory and receivables days are higher so this is a good place to start. The management of F should investigate why customers are taking longer to pay and rectify. If simply an issue of inefficiency, then this can be sorted by recruiting a new credit controller. If however, there have been customer complaints due to poor quality, then the issue of delayed payment can only be rectified by resolving customer concerns more quickly. Similarly, inventory days may be due to poor sales and the solution thus the same.

Financing

Using the overdraft to finance the purchase of non-current assets is not sustainable. The management of F need to reconsider their long term financing strategy, say through seeking new equity via a rights issue or raising additional long term loan finance.

3 Issues surrounding the use of financial performance indicators to monitor performance

All of the ratios reviewed so far have concentrated on the financial performance of the business. Many of these ratios, e.g. ROCE, gross profit margin, may be used to assess the performance of a division and of the manager's in charge of that division.

Achievement of these target ratios (financial performance indicators) may be linked to a reward system in order to motivate managers to improve performance.

However, there are a number of problems associated with the use of financial performance indicators to monitor performance:

Short-termism

Linking rewards to financial performance may tempt managers to make decisions that will improve short-term financial performance but may have a negative impact on long-term profitability. E.g. they may decide to cut investment or to purchase cheaper but poorer quality materials.

Manipulation of results

In order to achieve the target financial performance and hence their reward, managers may be tempted to fraudulently manipulate results. For example:

Accelerating revenue – revenue included in one year may be wrongly included in the previous year in order to improve the financial performance for the earlier year.

Delaying costs – costs incurred in one year may be wrongly recorded in the next year's accounts in order to improve performance and meet targets for the earlier year.

Understating a provision or accrual – this would improve the financial performance and may result in the targets being achieved.

Manipulation of accounting policies – for example, closing inventory values may be overstated resulting in an increase in profits for the year.

Do not convey the full picture

The use of these short-term financial performance indicators has limited benefit to the company as it does not convey the full picture regarding the factors that will drive long-term profitability, e.g. customer satisfaction, quality.

Therefore, when monitoring performance, a broader range of measures should be used. This will be reviewed in the next section.



Illustration 1 – Problems of financial performance indicators

A company may measure the performance of managers on the basis of a target ROCE. This may lead to the following undesirable behaviour:

- Managers may focus on generating short-term profit at the expense of long-term profit. For example, managers may reduce expenditure on training, research and development and maintenance.
- The ROCE will improve if the capital employed figure falls. Managers may therefore be reluctant to invest in new assets.
- Year-end results may be manipulated to improve ROCE. For example, managers may delay payments to creditors or inventory purchases.
- Managers may focus their attention on financial performance and neglect non-financial performance such as quality and customer service. This may improve profit in the short-term but lead to a long-term decline in profitability.



Test your understanding 3

Suggest methods of overcoming the problems of short-termism and manipulation of results and encouraging a long-term view.

4 Non-financial performance indicators (NFPIs)

- The previous section reviewed the problems of using financial performance indicators as the sole indicator of performance.
- This section will review the use of non-financial performance indicators as an additional tool to monitor performance and maximise long-term profitability.
- As we will see, a company may choose to use a mixture of financial and non-financial performance indicators in order to achieve the optimum system for performance measurement and control.
- A firm's success usually involves focussing on a small number of critical areas that they must excel at. These factors vary from business to business but could include:
 - Having a wide range of products that people want.
 - Having a strong brand name or image.
 - Low prices.
 - Quick delivery.
 - Customer satisfaction, perhaps through high quality.
- Most of these are best assessed using non-financial performance indicators. Financial performance appraisal often reveals the ultimate effect of operational factors and decisions but non-financial indicators are needed to monitor causes.



Illustration 2 – Non-financial performance measurement

BAA (the former state-owned British Airports Authority) uses regular customer surveys for measuring customer perceptions of a wide variety of service quality attributes, including:

- the cleanliness of its facilities
- the helpfulness of its staff
- the ease of finding one's way around the airport.

Public correspondence is also analysed in detail, and comment cards are available in the terminals so that passengers can comment voluntarily on service levels received.

Duty terminal managers also sample the services and goods offered by outlets in the terminals, assessing them from a customer perspective. They check the cleanliness and condition of service facilities and complete detailed checklists, which are submitted daily to senior terminal managers.

The company has also a wealth of internal monitoring systems that record equipment faults and failures, and report equipment and staff availability.

These systems are supported by the terminal managers who circulate the terminals on a full-time basis, helping customers as necessary, reporting any equipment faults observed and making routine assessments of the level of service provided by BAA and its concessionaires.



Test your understanding 4

Better Nutrition Co provides advice to clients in medical, dietary and fitness matters by offering consultation with specialist staff. The budget information for the year ended 31 May 20X0 is as follows:

	Budget	Actual
Total client enquiries		
– New Business	50,000	80,000
– Repeat business	30,000	20,000
Number of client consultations		
– New Business	15,000	20,000
– Repeat business	12,000	10,000
Mix of client consultations		
– Medical	6,000	5,500 (note)
– Dietary	12,000	10,000
– Fitness	9,000	14,500
Number of consultants employed		
– Medical	6	6 (note)
– Dietary	12	12
– Fitness	9	12
Number of client complaints	270	600

Note: Client consultations includes those carried out by outside specialists. There are now 4 full-time consultants carrying out the remainder of client consultations.

Other information:

- (i) Clients are charged a fee per consultation at the rate of: medical \$75; dietary \$50 and fitness \$50.
- (ii) Health foods are recommended and provided only to dietary clients at an average cost to the company of \$10 per consultation. Clients are charged for such health foods at cost plus 100% mark-up.
- (iii) Each customer enquiry incurs a variable cost of \$3, whether or not it is converted into a consultation.
- (iv) Consultants are each paid a fixed annual salary as follows: medical \$40,000; dietary \$28,000; fitness \$25,000.
- (v) Sundry other fixed cost: \$300,000.

Actual results for the year to 31 May 20X0 incorporate the following additional information:

- (i) A reduction of 10% in health food costs to the company per consultation was achieved through a rationalisation of the range of foods made available.
- (ii) Medical salary costs were altered through dispensing with the services of two full-time consultants and sub-contracting outside specialists as required. A total of 1,900 consultations were sub-contracted to outside specialists who were paid \$50 per consultation.
- (iii) Fitness costs were increased by \$80,000 through the hire of equipment to allow sophisticated cardio-vascular testing of clients.
- (iv) New computer software has been installed to provide detailed records and scheduling of all client enquiries and consultations. This software has an annual operating cost (including depreciation) of \$50,000.

Required:

- (a) Prepare a statement showing the financial results for the year to 31 May 20X0 in tabular format. This should show:
 - (i) the budget and actual gross margin for each type of consultation and for the company
 - (ii) the actual operating profit for the company
 - (iii) the budget and actual margin (\$) per consultation for each type of consultation.

(Expenditure for each expense heading should be shown in (i) and (ii) as relevant.)
- (b) Suggest ways in which each of the following performance measures could be used to supplement the financial results calculated in (a). You should include relevant quantitative analysis for each performance measure:
 - (1) Competitiveness
 - (2) Flexibility
 - (3) Resource utilisation
 - (4) Quality
 - (5) Innovation.

The balanced scorecard

The balanced scorecard approach to performance measurement and control emphasises the need to provide management with a set of information which covers all relevant areas of performance.

It focuses on four different perspectives and uses financial and non-financial indicators.

The four perspectives are:

Customer – what is it about us that new and existing customers value?

Internal business process – what processes must we excel at to achieve our financial and customer objectives?

Innovation and learning – how can we continue to improve and create future value?

Financial – how do we create value for our shareholders?

Within each of these perspectives a company should seek to identify a series of goals and measures.



Test your understanding 5

Faster Pasta is an Italian fast food restaurant that specialises in high quality, moderately priced authentic Italian pasta dishes and pizzas. The restaurant has recently decided to implement a balanced scorecard approach and has established the following relevant goals for each perspective.

Perspective	Goal
Customer perspective	• To increase the number of new and returning customers • To reduce the % of customer complaints
Internal business process	• To reduce the time taken between taking a customer's order and delivering the meal to the customer • To reduce staff turnover
Innovation and learning	• To increase the proportion of revenue from new dishes • To increase the % of staff time spent on training
Financial	• To increase spend per customer • To increase gross profit margin

The following information is also available for the year just ended and for the previous year.

	20X8	20X9
Total customers	11,600	12,000
– of which are new customers	4,400	4,750
– of which are existing customers	7,200	7,250
Customer complaints	464	840
Time between taking order and customer receiving meal	4 mins	13 mins
% staff turnover	12%	40%
% time staff spend training	5%	2%
Revenue	\$110,000	\$132,000
– revenue from new dishes	\$22,000	\$39,600
– revenue from existing dishes	\$88,000	\$92,400
Gross profit	\$22,000	\$30,360

Required:

Using appropriate measures, calculate and comment on whether or not Faster Pasta has achieved its goals.



Additional example on the balanced scorecard

One example reported in management literature of how the balanced scorecard might be applied is the US case of Analog Devices (a semi conductor manufacturer) in the preparation of its five-year strategic plan for 1988–1992.

Analog Devices had as its main corporate objective:

‘Achieving our goals for growth, profits, market share and quality creates the environment and economic means to satisfy the needs of our employees, shareholders, customers and others associated with the firm. Our success depends on people who understand the interdependence and congruence of their personal goals with those of the company and who are thus motivated to contribute towards the achievement of those goals.’

Three basic strategic objectives identified by the company were market leadership, sales growth and profitability.

The company adopted targets as follows: Customer perspective

- Percentage of orders delivered on time. A target was set for the five-year period to increase the percentage of on-time deliveries from 85% to at least 99.8%.
- Outgoing defect levels. The target was to reduce the number of defects in product items delivered to customers from 500, to fewer than 10, per month.
- Order lead time. A target was set to reduce the time between receiving a customer order to delivery from 10, to less than 3, weeks.

Internal perspective

- Manufacturing cycle time. To reduce this from 15 weeks to 4–5 weeks over the five-year planning period.
- Defective items in production. To reduce defects in production from 5,000, to fewer than 10, per month.

Learning and innovation perspective

- Having products rated 'number one' by at least 50% of customers, based on their attitudes to whether the company was making the right products, performance, price, reliability, quality, delivery, lead time, customer support, responsiveness, willingness to co-operate and willingness to form partnerships.
- The number of new products introduced to the market.
- Sales revenue from new products.
- The new product sales ratio. This was the percentage of total sales achieved by products introduced to the market within the previous six quarters.
- Average annual revenues for new products in their third year.
- Reducing the average time to bring new product ideas to the market.

Financial targets were set for revenue, revenue growth, profit and return on assets. But the idea was that the financial targets would flow from achieving the other targets stated above.

Analog Devices sought to adopt financial and non-financial performance measures within a single system, in which the various targets were consistent with each other and were in no way incompatible.

Benefits of the balanced scorecard:

- It focuses on factors, including non-financial ones, which will enable a company to succeed in the long-term.
- It provides external as well as internal information.

Problems with the balanced scorecard:

- The selection of measures can be difficult. For example, how should the company measure innovation?
- Obtaining information can be difficult. For example, obtaining feedback from customers can prove difficult.
- Information overload due to the large number of measures that may be chosen.
- Conflict between measures. For example, profitability may increase in the short-term through a reduction in expenditure on staff training.

The building block model

Fitzgerald and Moon developed a framework for the design and analysis of performance management systems, particularly within the context of service industries.

They based their analysis on three building blocks:

Dimensions

Dimensions are the goals for the business and suitable measures must be developed to measure each performance dimension. Dimensions are the areas that yield specific performance metrics for a company.

The six dimensions in the building block model can be split into two categories:

- downstream results (competitive and financial performance) and
- upstream determinants (quality of service, flexibility, resource utilisation and innovation) of those results.

The last four are the drivers of the top two.

Standards

Standards are the targets set for the metrics chosen from the dimensions.

To ensure success it is vital that employees view standards as achievable, fair and take ownership of them.

Rewards

Rewards are the motivators for the employees to work towards the standards set.

The reward system should be clearly understood by the staff and ensure their motivation. The rewards should be related to areas of responsibility that the staff member controls in order to achieve that motivation.



Performance Dimension (goal)	Examples of standards (measures)
Competitive performance	Market share Sales growth Customer base
Financial performance	Profitability Liquidity Risk
Quality of service	Reliability Responsiveness Competence
Flexibility	Volume flexibility Delivery speed
Resource utilisation	Productivity Efficiency
Innovation	Ability to innovate Performance of the innovations



Test your understanding 6 – Standards and rewards

Explain why it is important to:

- (i) consider ownership, achievability and equity when setting standards
- (ii) consider clarity, motivation and controllability when setting rewards.



Additional example on the building block model

Required:

Using the six dimensions of Fitzgerald and Moon suggest some measures (standards) for a national car dealership network.

Solution

Dimension	Measures
Financial performance	• Profit per dealer. • Average margins. • Average discount agreed as a % of displayed list price.
Competitive performance	• Local market share (e.g. look at new car registrations by postcode). • National market share (e.g. from published market research data).
Quality of service	• 'Mystery shopper data', i.e. outside consultants visit or ring dealerships posing as customers. • Post-sale satisfaction surveys of customers.
Flexibility	• Post-sale satisfaction surveys of customers to highlight whether they felt sales staff were flexible in getting different vehicle specifications, etc.
Resource utilisation	• Sales per employee. • Sales per square metre of available floor space. • Average length of time a second hand car (e.g. taken as part-exchange) remains unsold.
Innovation	• Central inspection by senior staff could enable a subjective assessment of local innovation to be made.

5 External considerations

Performance measures provide useful information to management which aid in the control of the business.

However, they need to be considered in the context of the environment external to the business to gain a full understanding of how the business has performed and to develop actions which should be taken to improve performance. External considerations which are particularly important are:

- **Stakeholders** – a stakeholder is any individual or group that has an interest in the business and may include:
 - shareholders
 - employees
 - loan providers
 - government
 - community
 - customers
 - environmental groups.

Stakeholders will have different objectives and companies may deal with this by having a range of performance measures to assess the achievement of these objectives.

- **Market conditions** – these will impact business performance. For example, a downturn in the industry, or in the economy as a whole, could have a negative impact on performance.
- **Competitors** – the actions of competitors must also be considered. For example, company demand may decrease if a competitor reduces its prices or launches a successful advertising campaign.



Test your understanding 7 – Stakeholder considerations

NW is an electricity and gas provider for residential and business properties.

The business was nationalised in the past (State owned) but has more recently become a privatised company.

Annual data from NW's accounts are provided below relating to its first three years of operation as a private sector concern.

Also shown, for comparison, is the proforma data as included in the privatisation documents. The proforma accounts are notional accounts prepared to show the performance of the company in its last year under public ownership as if it had applied private sector accounting conventions. They also incorporate a dividend payment based on the dividend policy declared in the prospectus.

The activities of privatised utilities are scrutinised by a regulatory body, which restricts the extent to which prices can be increased.

The demand for gas and electricity in the area served by NW has risen over time at a steady 2% pa, largely reflecting demographic trends.

Key financial and operating data for year ending 31 December (\$m)

	20X1 (proforma)	20X2 (actual)	20X3 (actual)	20X4 (actual)
Turnover	450	480	540	620
Operating profit	26	35	55	75
Taxation	5	6	8	10
Profit after tax	21	29	47	65
Dividends	7	10	15	20
Total assets	100	119	151	191
Capital expenditure	20	30	60	75
Wage bill	100	98	90	86
Directors' emoluments	0.8	2.0	2.3	3.0
Employees (number)	12,000	11,800	10,500	10,000
Retail price index (RPI)	100	102	105	109

Required:

Using the data provided, assess the extent to which NW has met the interests of the following groups of stakeholders in its first three years as a privatised enterprise. If relevant, suggest what other data would be helpful in forming a more balanced view.

- (i) Shareholders
- (ii) Consumers
- (iii) Workforce
- (iv) Government, through NW's contribution to the achievement of the government's objectives of price stability and economic growth.

6 Sustainability

In chapter 4, we discussed the importance of sustainability to an organisation. These issues are also important to consider when we are considering suitable performance indicators. If an organisation focuses solely on short-term financial gain, there is a risk that long-term sustainability issues will not be addressed. Whilst an organisation may therefore experience higher short-term profits, these profits may not be sustainable longer term, if:

- the materials used will not be available in the future,
- environmentally conscious customers switch to more sustainability focussed competitors,
- regulators impose restrictions or fines for poor sustainability practices.

This is even criticism of some of the non-financial performance indicators (NFPIs) including those in the balanced scorecard, as they are still more focused on shareholder wealth rather than sustainability.

Some have argued that sustainability can be included in the balanced scorecard four perspectives, for example:

- **Customer perspective**

Taking the interests of sustainability stakeholders into account e.g. green/ environmentally conscious customers; local communities; government regulators.

- **Internal business process perspective**

Have the environmental impacts of processes been considered?
E.g. wastage, recycling, pollution etc.

Do HR processes consider best practices around health and safety, diversity, equal opportunities, etc.?

- **Learning and growth perspective**

Do training and development programmes promote sustainability values as part of the culture of the organisation?

Are innovations resulting in efficiencies that reduce wastage or pollution?
Or is the organisation developing more environmentally friendly products?

In order to embed these sustainability considerations into the performance measurement system, organisations can include sustainability focussed KPIs to measure their progress toward sustainability objectives. These could include:

Energy

- Energy consumption
- Energy saved due to implemented improvements

Water

- Water consumption/Water footprint
- % of water reused or recycled

Waste

- Waste generated
- Waste by type and disposal method
- Waste production rate

Emissions

- Toxic emissions
- CO₂ emissions
- Greenhouse gas emissions
- Carbon footprint

Materials

- Raw material usage
- % of non-renewable materials used
- % of recycled materials used
- Product recycling rate %

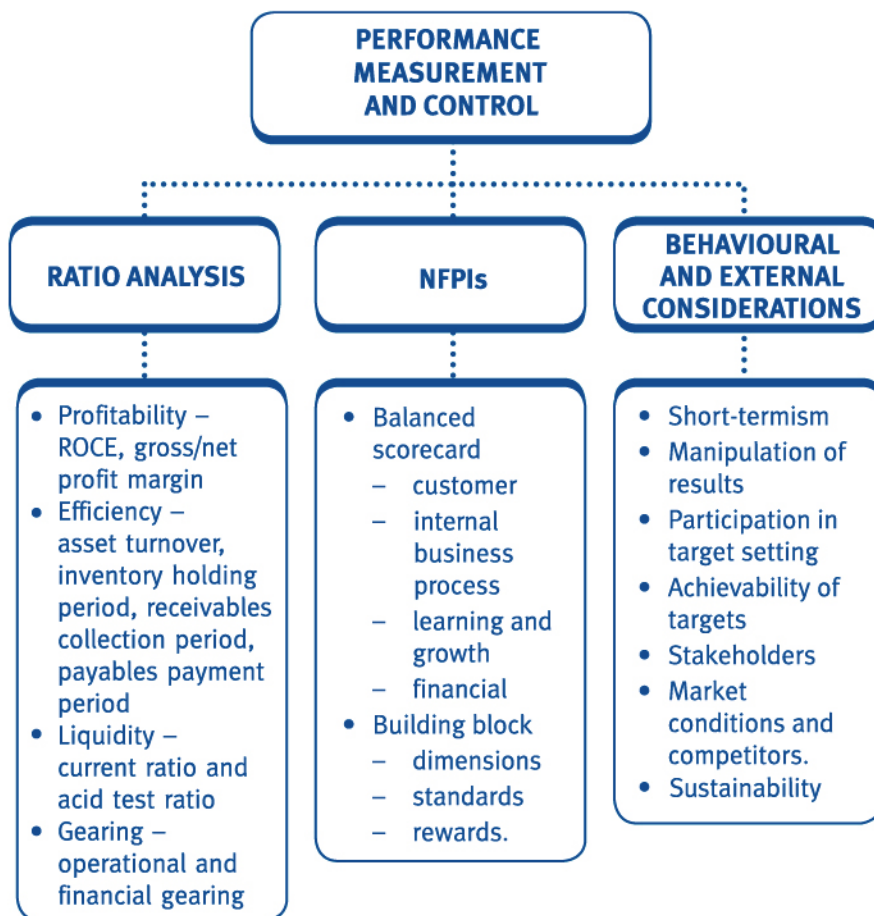
Supply chain

- % of suppliers that comply with established sustainability strategy
- Supply chain miles

Social

- Number of health and safety incidents (workplace safety)
- Number of sick days (employees' health and well-being)

7 Chapter summary



Test your understanding answers



Test your understanding 1

Profitability ratios

	20X9	20X8
Gross profit margin = gross profit/turnover (%)	31.50%	33.69%
Operating profit margin = operating profit/ turnover (%)	6.18%	7.49%
ROCE = operating profit/cap. emp. (%)	9.82%	10.03%
Asset turnover = turnover/cap. emp.	1.59	1.34
Note: Turnover = total production cost + gross profit	9,544,000	7,664,000

Comment

Overall, profitability has deteriorated slightly year on year.

Gross profit margin – Despite an increase in turnover of 24.6%, the gross profit margin has fallen by over 2% to 31.5%. Although turnover has shown a significant increase, the production costs have increased at a faster rate of 28.7% year on year. The falling gross profit margin may indicate that the company is unable to achieve the same level of sales prices as it was in 20X8 or is not as efficient at controlling its production costs.

Operating profit margin – Again, despite an increase in turnover of 24.6%, the operating profit margin has fallen from 7.49% to 6.18%. The falling operating profit margin may indicate that the company is unable to achieve the same level of sales prices as it was in 20X8 or is not as efficient at controlling all of its production costs. Indeed, the operating profit margin falls, but not as much as the gross profit margin. This suggests that non-production costs have indeed been managed better. In other words, non-production costs are a lower percentage of revenue in 20X9, so the only cause of the reduction in the operating profit margin is the fall in the gross profit margin.

Asset turnover – this has actually shown a small improvement year on year from 1.34 in 20X8 to 1.59 in 20X9. This shows that the company is getting better at generating turnover from the capital employed within the business.

ROCE – Despite the improvement in asset turnover, the ROCE has actually fallen slightly from 10.03% in 20X8 to 9.83% in 20X9. This means that the company is not as good at generating operating profit from its capital employed. The decrease in the ROCE is due to the fall in the operating profit margin.

It would be useful to obtain a further breakdown of turnover and costs, in order to fully understand the reasons for the changes and to prevent any further decline in the ratios discussed. It would also be useful to obtain the average ratios for the industry in order to gauge Super Soups performance against that of its competitors.

**Test your understanding 2**

Current ratio	$\frac{(147.9 + 393.4 + 53.8 + 6.2)}{(275.1 + 284.3)} = 601.3/559.4$	
		= 1.07
Quick ratio	$(601.3 - 147.9)/559.4 =$	0.81
Receivables payment period	$393.4/1,867.5 \times 365 =$	77 days
Inventory turnover period	$147.9/(1,867.5 - 489.3) \times 365 =$	39 days
Payables payment period	$275.1/(1,867.5 - 489.3) \times 365 =$	73 days

**Test your understanding 3**

- Rewards may be linked to a wider variety of performance measures including some non-financial measures.
- Capital investment decisions may be reviewed centrally and judged on the basis of net present value (NPV).
- Managers may be rewarded according to the overall performance of the company rather than their own responsibility centre. This may help goal congruence but may not be motivating if poorly-performing managers are rewarded in the same way as managers who are performing well.



Test your understanding 4

(a) Operating statement for the year ended 31 May 20X0

	Medical \$000	Dietary \$000	Fitness \$000	Total \$000
Budget				
Client fees	450.0	600.0	450.0	1,500.0
– M ($\$75 \times 6,000$)				
– D ($\$50 \times 12,000$)				
– F ($\$50 \times 9,000$)				
Health food mark-up ($\$10 \times 12,000 \times 100\%$)		120.0		120.0
Salaries (consultants $\times$ salary)	(240.0)	(336.0)	(225.0)	(801.0)
Budget gross margin	210.0	384.0	225.0	819.0
Variances				
Fee income gain/(loss)	(37.5)	(100.0)	275.0	137.5
– M [$\$75 \times (5,500 - 6,000)$]				
– D [$\$50 \times (10,000 - 12,000)$]				
– F [$\$50 \times (14,500 - 9,000)$]				
Health food mark-up loss ($\$10 \times 2,000$) + ($10\% \times 100K$)		(30.0)		(30.0)
Salaries increase				
– M ($2 \times \$40,000$) – ($1,900 \times \$50$)				
– F ($3 \times \$25,000$)	(15.0)		(75.0)	(90)
Extra fitness equipment			(80)	(80)
Actual gross margin	157.5	254.0	345.0	756.5
Less: Company costs				
Enquiry costs – budget ($\$3 \times 80K$)				(240)
Enquiry costs – variance ($\$3 \times 100K$) – ($\$3 \times 80K$)				(60)
General fixed costs				(300.0)
Software systems cost				(50.0)
Actual net profit				106.5
 Budget margin per consultation (\$)	 35.00	 32.00	 25.00	
Actual margin per consultation (\$)	28.64	25.40	23.79	

- (b) Competitiveness may be measured in terms of the relative success/failure in obtaining business from enquiries from customers. The percentages are as follows.

	Budget	Actual
Uptake from enquiries		
New business	30%	25%
Repeat business	40%	50%

Repeat business suggests customer loyalty. The new business figures are disappointing, being below the budgeted level of uptake. In absolute terms, however, new business is 5,000 consultations above budget whereas repeat business is 2,000 consultations below budget.

There are variations within the types of consultation. Medical and dietary are down on budget by approximately 8% and 16% respectively. Fitness is up on budget by approximately 60%.

Flexibility may relate to the company being able to cope with flexibility of volume, delivery speed and job specification. Examples of each may be taken from the information in the management accounts. Additional fitness staff have been employed to cope with the extra volume of clients in this area of business.

Medical staff levels have been reorganised to include the use of external specialists. This provides flexibility where the type of advice required (the job specification) is wider than expected and may improve delivery speed in arranging a consultation more quickly for a client.

Dietary staff numbers are unchanged even though the number of consultations has fallen by 16% from budget. This may indicate a lack of flexibility. It may be argued that the fall in consultations would warrant a reduction in consultant numbers from 12 to 11. This could cause future flexibility problems, however, if there was an upturn in this aspect of the business.

Resource utilisation measures the ratio of output achieved from input resources. In this case the average consultations per consultant may be used as a guide:

	Budget	Actual	Average consultations per consultant Budget Rise (+) or fall (-)%
Medical (full-time only)	1,000	900	-10%
Dietary	1,000	833	-16.7%
Fitness	1,000	1,208	+20.8%

These figures show that:

- (a) Medical consultants are being under-utilised. Could this be due to a lack of administrative control? Are too many cases being referred to the outside specialists? This may, however, be viewed as a consequence of flexibility – in the use of specialists as required.
- (b) Dietary consultants are being under-utilised. Perhaps there should be a reduction in the number of consultants from 12 to 11 as suggested above.
- (c) Fitness consultants are carrying out considerably more consultations (+20.8%) than budgeted. There are potential problems if their quality is decreasing. Overall complaints from clients are up by 120%. How many relate to fitness clients?

It may be, however, that the new cardio-vascular testing equipment is helping both throughput rates and the overall level of business from fitness clients.

Quality of service is the totality of features and characteristics of the service package that bear upon its ability to satisfy client needs. Flexibility and innovation in service provision may be key quality factors.

The high level of complaints from clients (up from 1% to 2% of all clients) indicates quality problems which should be investigated.

Quality of service may be improving. For example, the new cardio-vascular testing equipment may be attracting extra clients because of the quality of information which it provides. Quality may also be aided through better management of client appointments and records following the introduction of the new software systems.

Innovation may be viewed in terms of the performance of a specific innovation. For example, whether the new computer software improved the quality of appointment scheduling and hence resource utilisation; improved competitiveness in following up enquiries and hence financial performance; improved flexibility in allowing better forward planning of consultant/client matching.

Innovation may also be viewed in terms of the effectiveness of the process itself. Are staff adequately trained in its use? Does the new software provide the data analysis which is required?



Test your understanding 5

Customer perspective

Goal: To increase the number of new and returning customers.

Measure: The number of new customers has increased year on year from 4,400 to 4,750. This is an 8.0% increase. The number of returning customers has also increased slightly from 7,200 to 7,250, i.e. a 1.0% increase.

Comment: The company has achieved its goal of increasing the number of new and existing customers. It is worth noting that the proportion of customers who are returning customers has fallen slightly from 62.1% to 60.4% of the total customers. This could indicate a small drop in the level of customer satisfaction.

Goal: To decrease the % customer complaints.

Measure: The percentage of customer complaints has increased from 4% ($464 \div 11,600$) to 7% ($840 \div 12,000$).

Comment: Faster Pasta should investigate the reasons for the increase in customer complaints and take the required action immediately in order to ensure that it can meet this goal in the future.

Internal perspective

Goal: To reduce the time taken between taking the customer's order and delivering the meal to the customer.

Measure: The time taken has more than tripled from an average of 4 minutes in 20X8 to an average of 13 minutes in 20X9.

Comment: Customers may place a high value on the fast delivery of their food. The increase in time may be linked to the increased number of customer complaints. If this continues customer satisfaction, and therefore profitability, will suffer in the long-term. The restaurant should take steps now in order to ensure that this goal is achieved going forward.

Goal: To reduce staff turnover.

Measure: This has risen significantly from 12% to 40% and hence the business has not achieved its goal.

Comment: The reasons for the high staff turnover should be investigated immediately. This may be contributing to longer waiting times and the increase in customer complaints. This will impact long-term profitability.

Innovation and learning perspective

Goal: To increase the proportion of revenue from new dishes.

Measure: This has increased year on year from 20% ($\$22,000 \div \$110,000$) in 20X8 to 30% ($\$39,600 \div \$132,000$) in 20X9. Therefore, the restaurant has achieved its goal.

Comment: This is a favourable increase and may have a positive impact on long-term profitability if the new products meet the needs of the customers.

Goal: To increase the % of staff time spent on training.

Measure: This has fallen significantly from 5% to only 2% and hence the company is not achieving its goal.

Comment: Staff may be unsatisfied if they feel that their training needs are not being met. This may contribute to a high staff turnover. In addition, staff may not have the skills to do the job well and this would impact the level of customer satisfaction.

Financial perspective

Goal: to increase spend per customer.

Measure: Spend per customer has increased from \$9.48 ($\$110,000 \div 11,600$) to \$11.00 ($\$132,000 \div 12,000$), i.e. a 16.0% increase.

Comment: This is a favourable increase. However, the issues discussed above must be addressed in order to ensure that this trend continues.

Goal: To increase gross profit margin.

Measure: The gross profit margin has increased year on year from 20% ($\$22,000 \div \$110,000$) to 23% ($\$30,360 \div \$132,000$).

Comment: This is a favourable increase. However, the issues discussed above must be addressed in order to ensure that this trend continues.



Test your understanding 6

- (i) Managers who participate in the setting of standards are more likely to accept and be motivated by the standards than managers on whom standards are imposed. An achievable standard is a better motivator than an unachievable one – although research has been undertaken into how much ‘stretch’ ought to be built into budgets. When setting standards across an organisation, care should be undertaken to ensure that all managers have equally-challenging standards. Achieving equity in this last regard may be difficult when measures used for different managers and business sectors within an organisation may be very different in character to one another.
- (ii) Consideration of rewards involves use of concepts including ‘clarity’, ‘motivation’ and ‘controllability’. Goal clarity contributes to motivation. For example, a standard of ‘achieving 4 product innovations per year’ might be a more effective motivator than ‘giving a high profile to product innovation’. The actual means of motivation may involve performance-related salary bonuses, an assessment scheme point score or access to promotion channels. Managers will be better motivated if they actually control the factors contributing to achievement of the measures and standards on which their rewards are based.



Test your understanding 7 – Stakeholder considerations

Shareholders

Shareholders will want returns in the form of dividends and share price growth. By following policies to promote these requirements NW will maximise shareholder wealth.

The dividend has risen from a proforma 7c in 20X1 to 20c in 20X4. This represents growth of approximately 186% over the period. PAT has increased from 21 in 20X1 to 65 in 20X4, an increase of 210%. Since inflation is only 9% for the period, it would suggest that the needs of the shareholders have been met.

Consumers

Consumers will be interested in prices. The regulator restricts the extent by which prices can be increased.

We have information about the volume of the market (growing at 2% pa) and can therefore measure the price rises by removing the volume growth from turnover.

	20X1	20X2	20X3	20X4
Turnover	\$450m	\$480m	\$540m	\$620m
		$\times 1/1.02$	$\times 1/1.02^2$	$\times 1/1.02^3$
Turnover in 20X1 volume	450	471	519	584

We can see that after taking out the growth, prices have risen at approximately 9.1% pa, which is well above the rate of inflation for the period (3%).

Whether or not this is justified depends on factors such as where the money has been spent. Has it gone into capital expenditure (improving the supplies or preventing leaks) or has it been used to increase dividends?

Workforce

The workforce has fallen by 2,000 from its 12,000 level in 20X1. Whilst it is possible that NW was overstaffed, shedding over 15% of the workforce will have affected morale.

Average wages have risen from \$8,333 to \$8,600 over the period, a rise of just over 3% for the period. Had the workforce enjoyed pay rises in line with inflation they could have expected to earn \$9,083 in 20X4. This means they are actually worse off in real terms.

Without more information (e.g. skills mix of labour force, full/part-time employees) it is hard to comment, but the increased profitability of NW does not appear to have been passed on to them.

At the same time, the directors' emoluments have nearly quadrupled. We could again do with more information such as the number of directors involved. Part of the increase will be to bring fees in line with the private sector and part of it could be linked in with the share price. However, their fees as a percentage of the whole wage bill have risen from 0.8% to 3.4% over the period.

The figures probably will not include other perks such as share options. The directors may increasingly find themselves having to justify 'fat cat' salaries.

Government

Price stability

Prices have risen by 38% in absolute, and 30% in real, terms which will not be in line with price stability.

Wages have been held down to less than the headline RPI, but at the same time directors' emoluments have risen sharply.

Economic growth

This is difficult to measure without more details, but we could calculate various ratios such as ROCE or operating margin to measure the situation. Both have shown improvement over the period.

	20X1	20X2	20X3	20X4
Operating margin	5.8%	7.2%	10.2%	12.1%

Capital expenditure has risen by 275% over the period. This would be expected to generate a knock-on growth elsewhere in the economy.

Divisional performance measurement and transfer pricing

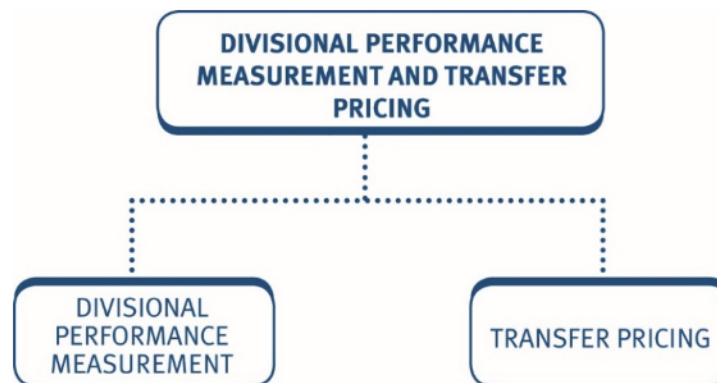
Chapter learning objectives

Upon completion of this chapter you will be able to:

- Explain and illustrate the basis for setting a transfer price using variable cost, full cost and the principles behind allowing for intermediate markets.
- Explain how transfer prices can distort the performance assessment of divisions and decisions made.
- Explain the meaning of, and calculate, Return on Investment (ROI) and Residual Income (RI), and discuss their shortcomings.
- Compare divisional performance and recognise the problems of doing so.



One of the PER performance objectives (PO14) is to measure and assess departmental and business performance. Working through this chapter should help you understand how to demonstrate that objective.



1 Divisional performance measurement

Type of division	Description	Typical measures used to assess performance
Cost centre	Division incurs costs, but has no revenue stream, e.g. the IT support department of an organisation.	- Total cost and cost per unit. - Cost variances. - NFPs related to quality, productivity & efficiency.
Revenue centre	Division is only responsible for the generation of revenue.	- Total revenue and revenue per unit. - Revenue (sales) variances.
Profit centre	- Division has both costs and revenue. - Manager does not have the authority to alter the level of investment in the division.	All of the above PLUS: - Total sales and market share. - Profit. - Sales variances. - Working capital ratios (depending on the division concerned). - Non-financial performance indicators (NFPs) e.g. related to productivity, quality and customer satisfaction.
Investment centre	- Division has both costs and revenue. - Manager does have the authority to invest in new assets or dispose of existing ones.	All of the above PLUS: - Return on investment (ROI). - Residual income (RI). These measures are used to assess the investment decisions made by managers and are discussed in more detail below.

Important point: For each of these care must be taken to assess managers on controllable factors only. So for example, the manager of a cost centre should only be assessed on controllable costs.

Return on investment (ROI)

This is a similar measure to ROCE but is used to appraise the investment decisions of an individual department.

$$\text{ROI} = (\text{Controllable profit} / \text{Capital employed}) \times 100$$

- Controllable profit is usually taken after depreciation but before tax. However, in the exam you may not be given this profit figure and so you should use the profit figure that is closest to this. Assume the profit is controllable, unless told otherwise.
- Capital employed is total assets less current liabilities or total equity plus long term debt. Use net assets if capital employed is not given in the question.
- Non-current assets might be valued at cost, net replacement cost or carrying value. The value of assets employed could be either an average value for the period as a whole or a value as at the end of the period. An average value for the period is preferable. However, in the exam you should use whatever figure is given to you.



Test your understanding 1 – ROI calculation

An investment centre has reported a profit of \$28,000. It has the following assets and liabilities:

	\$	\$
Non-current assets (at carrying value)		100,000
Inventory	20,000	
Trade receivables	30,000	
Total current assets	50,000	
Trade payables	(8,000)	
Net current assets		42,000
		142,000

Required:

Calculate the ROI for the division. State any additional information that would be useful when calculating the ROI.



Additional example on ROI

Division A of Babbage Group had investments at the year end of \$56 million. These include the cost of a new equipment item costing \$3 million that was acquired two weeks before the end of the year. This equipment was paid for by the central treasury department of Babbage, and is recorded in the accounts as an inter-company loan.

The profit of division A for the year was \$7 million before deducting head office recharges of \$800,000.

Required:

What is the most appropriate measure of ROI for Division A for the year?

Solution

Since the new equipment was bought just two weeks before the year end, the most appropriate figure for capital employed is \$53 million, not \$56 million.

The figure for profit should be the controllable profit of \$7 million.

$\text{ROI} = \$7 \text{ million} / \$53 \text{ million} = 13.2\%$

Evaluation of ROI as a performance measure

ROI is a popular measure for divisional performance but has some serious failings which must be considered when interpreting results.

Advantages

- It is widely used and accepted since it is line with ROCE which is frequently used to assess overall business performance.
- As a relative measure it enables comparisons to be made with divisions or companies of different sizes.
- It can be broken down into secondary ratios for more detailed analysis, i.e. profit margin and asset turnover.

Disadvantages

- It may lead to dysfunctional decision making, e.g. a division with a current ROI of 30% would not wish to accept a project offering a ROI of 25%, as this would dilute its current figure. However, the 25% ROI may meet or exceed the company's target.
- ROI increases with the age of the asset if carrying values are used, thus giving managers an incentive to hang on to possibly inefficient, obsolescent machines.
- It may encourage the fraudulent manipulation of profit and capital employed figures to improve results, e.g. in order to meet bonus targets.
- Different accounting policies can confuse comparisons (e.g. depreciation policy).



Test your understanding 2 – Disadvantages of ROI

Nielsen Co has two divisions with the following information:

	Division A	Division B
	\$	\$
Profit	90,000	10,000
Capital employed	300,000	100,000
ROI	30%	10%

Division A has been offered a project costing \$100,000 and giving annual returns of \$20,000. Division B has been offered a project costing \$100,000 and giving annual returns of \$12,000. The company's cost of capital is 15%. Divisional performance is judged on ROI and the ROI –related bonus is sufficiently high to influence the managers' behaviour.

Required:

- What decisions will be made by management if they act in the best interests of their division (and in the best interests of their bonus)?
- What should the managers do if they act in the best interests of the company as a whole?

Residual income (RI)

$RI = \text{Controllable profit} - \text{Notional interest on capital}$

- Controllable profit is calculated in the same way as for ROI.
- Notional interest on capital = the capital employed in the division multiplied by a notional cost of capital or interest rate.
 - Capital employed is calculated in the same way as for ROI.
 - The selected cost of capital could be the company's average cost of funds (cost of capital). However, other interest rates might be selected, such as the current cost of borrowing, or a target ROI. (You should use whatever rate is given in the exam).



Test your understanding 3 – RI calculation

An investment centre has net assets of \$800,000, and made profits before interest and tax of \$160,000. The notional cost of capital is 12%.

Required:

Calculate and comment on the RI for the period.

Evaluation of RI as a performance measure

Compared to using ROI as a measure of performance, RI has several advantages and disadvantages:

Advantages

- It encourages investment centre managers to make new investments if they add to RI. A new investment might add to RI but reduce ROI. In such a situation, measuring performance by RI would not result in dysfunctional behaviour, i.e. the best decision will be made for the business as a whole.
- Making a specific charge for interest helps to make investment centre managers more aware of the cost of the assets under their control.
- Risk can be incorporated by the choice of interest rate used: different interest rates for the notional cost of capital can be applied to investments with different risk characteristics.

Disadvantages

- It does not facilitate comparisons between divisions since the RI is driven by the size of divisions and of their investments.
- It is based on accounting measures of profit and capital employed which may be subject to fraudulent manipulation, e.g. in order to obtain a bonus payment.



Test your understanding 4 – ROI vs RI

An investment centre has net assets of \$800,000, and made profits before interest of \$160,000. The notional cost of capital is 12%. This is the company's target return.

An opportunity has arisen to invest in a new project costing \$100,000. The project would have a four-year life, and would make profits of \$15,000 each year.

Required:

- (a) What would be the ROI with and without the investment? (Base your calculations on opening carrying values). Would the investment centre manager wish to undertake the investment if performance is judged on ROI?
- (b) What would be the average annual RI with and without the investment? (Base your calculations on opening carrying values). Would the investment centre manager wish to undertake the investment if performance is judged on RI?



Additional example on ROI and RI

Two divisions of a company are considering new investments.

	Division X	Division Y
Net assets	\$1,000,000	\$1,000,000
Current divisional profit	\$250,000	\$120,000
Investment in project	\$100,000	\$100,000
Projected project profit	\$20,000	\$15,000

Company's required ROI = 18%

Required:

Assess the projects using both ROI and RI.

Solution

Consider divisional performance:

	Division X	Division Y
Without project		
Divisional ROI	25%	12%
Divisional RI (\$)	+ 70,000	– 60,000
With project		
Investment (\$)	1,100,000	1,100,000
Profit (\$)	270,000	135,000
ROI	24.5%	12.3%
RI (\$)	72,000	– 63,000
Project in isolation		
ROI	20%	15%
RI (\$)	+ 2,000	– 3,000

Based on ROI, Division X will reject its project as it dilutes its existing ROI of 25%. This is the wrong decision from the company perspective as the project ROI of 20% beats the company hurdle of 18%.

Likewise Division Y will accept its project, which should be rejected as it fails to hit the company target.

In each case there is a conflict between the company and divisional viewpoints.

RI does not have this problem as we simply add the project RI to the divisional figures.

Comparing divisional performance

Divisional performance can be compared in many ways. ROI and RI are common methods but other methods could be used.

- Variance analysis – is a standard means of monitoring and controlling performance. Care must be taken in identifying the controllability of, and responsibility for, each variance.
- Ratio analysis – there are several profitability and liquidity measures that can be applied to divisional performance reports.
- Other management ratios – this could include measures such as sales per employee or square foot as well as industry specific ratios such as transport costs per mile, brewing costs per barrel, overheads per chargeable hour.
- Other information – such as staff turnover, market share, new customers gained, innovative products or services developed.



Test your understanding 5

Comment on the problems that may be involved in comparing divisional performance.

2 Transfer pricing

Introduction



A transfer price is the price at which goods or services are transferred from one division to another within the same organisation.

Objectives of a transfer pricing system

- Goal congruence

The decisions made by each profit centre manager should be consistent with the objectives of the organisation as a whole, i.e. the transfer price should assist in maximising overall company profits.

A common feature of exam questions is that a transfer price is set that results in sub-optimal behaviour. For example, the buying division may be encouraged to purchase from an external source, rather than the internal selling division, because the transfer price is set too high. This could reduce overall company profits despite being the best option for the selling division.

- Performance measurement

The buying and selling divisions will be treated as profit centres. The transfer price should allow the performance of each division to be assessed fairly. Divisional managers will be demotivated if this is not achieved.

- Autonomy

The system used to set transfer prices should seek to maintain the autonomy of profit centre managers. If autonomy is maintained, managers tend to be more highly motivated but sub-optimal decisions may be made. For example, managers may make the decision to buy or sell externally, when an internal transfer would benefit the company more.

- Recording the movement of goods and services

In practice, an extremely important function of the transfer pricing system is simply to assist in recording the movement of goods and services between divisions.



The impact of a transfer price

Transfer pricing does nothing more than move profits from one division to another. For example, consider a company with two divisions, A and B, where A makes a product for \$10 per unit and B sells 1,000 units for \$25 each.

If there was no transfer price, then the divisional profits/losses and the total profit/loss for the company would be as follows:

	Division A	Division B	Company total
	\$	\$	\$
Sales (1,000 × \$25)	–	25,000	25,000
Costs (1,000 × \$10)	(10,000)	–	(10,000)
Profit/(loss)	(10,000)	25,000	15,000

If, instead we were to introduce a transfer price of \$15 per unit (i.e. B must pay A \$15 for each unit produced) then the divisional and company profits would be as follows:

	Division A	Division B	Company total
	\$	\$	\$*
Sales (1,000 × \$15)	15,000	25,000	25,000
Costs (1,000 × \$15)	(10,000)	(15,000)	(10,000)
Profit/(loss)	5,000	10,000	15,000

* the transfer price is ignored in determining the company totals.

It can be seen that the transfer price has had no impact on overall company profits. But \$15,000 (10,000 units at \$15 per unit transfer price) has been transferred from division B to division A.

There are many reasons why businesses choose to do this which are explained in the objectives of a transfer pricing system above.

The problem for businesses is in determining the level of transfer price – division A, in the example, will always want it to be higher in order to maximise revenue, whilst division B will want it to be lower in order to minimise costs. If the business gets it wrong then the divisional managers might buy or sell externally which would harm the business overall.

Profit Statements including transfer prices

We can show the impact of transfer prices on divisional and company profits using the pro-forma below. In a company where division A sells to division B internally:

	Division A	Division B	Total company
Revenue			
External	X	X	X
Internal	Y*	–	n/a**
Costs			
Internal variable costs	–	(Y)*	n/a**
External variable costs	(X)	(X)	(X)
External fixed costs	(X)	(X)	(X)
Profit	X	X	X

*The internal revenue of the selling division will be the same as the internal cost of the buying division.

**Internal costs and revenues do not impact company profit, so they are not included in calculating the total profit of the company.



Example profit statement

Z Ltd has two divisions; division X and division Y. Division X manufactures component C which it can sell externally for \$10, or internally to division Y. In the last period, division X sold 2,000 units of component C externally, and 3,000 internally. The variable cost of component C is \$4 per unit, and division X incurred fixed costs of \$10,000.

Division Y used the 3,000 components purchased from division X to produce 3,000 units of product P, and sold all of these units for \$25 per unit after incurring additional variable costs of \$8 per unit. Division Y incurred fixed costs of \$14,000 in the last period.

Required:

- (a) Prepare a profit statement showing the profit for each division, and for Z Ltd as a whole, if the transfer price is set at the variable cost to manufacture component C.
- (b) Show how this would change if the transfer price is set at the external market price of component C.

Solution:

- (a) Transfer price set at \$4 per unit of component C

	Division X	Division Y	Company total
	\$	\$	\$
Revenue			
External			
– X: 2,000 × \$10	20,000		
– Y: 3,000 × \$25		75,000	95,000
Internal			
– X: 3,000 × \$4	12,000	–	–
Costs			
Internal variable costs	–	(12,000)	–
External variable costs			
– X: 5,000 × \$4	(20,000)		
– Y: 3,000 × \$8		(24,000)	(44,000)
External fixed costs	(10,000)	(14,000)	(24,000)
Profit	2,000	25,000	27,000

- (b) Transfer price set at the external market price of \$10. Only the internal costs and revenues change.

	Division X	Division Y	Company total
	\$	\$	\$
Revenue			
External	20,000	75,000	95,000
Internal			
– X: 3,000 × \$10	30,000	–	–
Costs			
Internal variable costs	–	(30,000)	–
External variable costs	(20,000)	(24,000)	(44,000)
External fixed costs	(10,000)	(14,000)	(24,000)
Profit	20,000	7,000	27,000

Changing the transfer price has had a significant impact on the profit split between the two divisions, but no impact on the overall company profit. This highlights the effect of the transfer price on performance measurement.

Setting the transfer price

There are two main methods available:

Method 1: Market based approach

If an external market exists for the transferred goods, then the transfer price could be set at the external market price.

Advantages of this method:

- The transfer price should be deemed to be fair by the managers of the buying and selling divisions. The selling division will receive the same amount for any internal or external sales. The buying division will pay the same for goods if they buy them internally or externally.
- The company's performance will not be impacted negatively by the transfer price because the transfer price is the same as the external market price.

Disadvantages of this method:

- There may not be an external market price.
- The external market price may not be stable. For example, discounts may be offered to certain customers or for bulk orders.
- Savings may be made from transferring the goods internally. For example, delivery costs will be saved. These savings should ideally be deducted from the external market price before a transfer price is set, giving an "adjusted market price".

Method 2: Cost based approach

The transferring division would supply the goods at **cost plus a % profit**.

A standard cost should be used rather than the actual cost since:

- Actual costs do not encourage the selling division to control costs.
- If a standard cost is used, the buying division will know the cost in advance and can therefore budget accordingly.

There are a number of different standard costs that could be used:

- Full cost
- Marginal (variable) cost
- Opportunity cost.

Each of these will be reviewed in the following examples.



Test your understanding 6 – Full cost and marginal cost

A company has two profit centres, Centre A and Centre B. Centre A supplies Centre B with a part-finished product. Centre B completes the production and sells the finished units in the market at \$35 per unit. There is no external market for Centre A's part-finished product.

Budgeted data for the year:

	Division A	Division B
Number of units transferred/sold	10,000	10,000
Material cost per unit	\$8	\$2
Other variable costs per unit	\$2	\$3
Annual fixed costs	\$60,000	\$30,000

Required:

Calculate the budgeted annual profit for each division and for the company as a whole if the transfer price for the components supplied by division A to division B is:

- Full cost plus 10%
- Marginal cost plus 10%
- Evaluate both transfer prices from the perspective of each individual division and from the perspective of the company as a whole.



Additional example on transfer pricing

Archer Group has two divisions, Division X and Division Y. Division X manufactures a component X8 which is transferred to Division Y. Division Y uses component X8 to make a finished product Y14, which it sells for \$20. There is no external market for component X8.

Costs are as follows:

	Division X	Division Y
	Component X8	Product Y14
Variable production cost	\$5 per unit	\$3 per unit*
Annual fixed costs	\$40,000	\$80,000

*Excluding the cost of transferred units of X8.

The budgeted output and sales for Product Y14 is 20,000 units. One unit of component X8 goes into the manufacture of one unit of Y14.

The profit of the company as a whole will be maximised if Divisions X and Y produce up to their capacity, or to the maximum volume of sales demand. For each extra unit sold, the marginal revenue is \$20 and the marginal cost is \$8 (\$5 + \$3); therefore, the additional contribution is \$12 for each extra unit of Y14 made and sold.

Since there is no external market for component X8, the transfer price will be cost-based. 'Cost' might be marginal cost or full cost. The transfer price might also include a mark-up on cost to allow a profit to Division X.

The maximum transfer price that the buying division will pay

Division Y has a marginal cost of \$3 per unit, and earns revenue of \$20 for each unit sold. In theory, Division Y should therefore be prepared to pay up to \$17 ($\$20 - \$3$) for each unit of X8.

It could be argued, however, that Division Y would not want to sell Product Y14 at all if it made a loss. Division Y might therefore want to cover its fixed costs as well as its variable costs. Fixed costs in Division Y, given a budget of 20,000 units, are \$4 per unit. The total cost in Division Y is \$7 ($\$3 + \$4$). On this basis, the maximum transfer price that Division Y should be willing to pay is \$13 ($\$20 - \$7$).

Transfer price = marginal cost

The short-term opportunity cost to Division X of transferring units of X8 to Division Y is the marginal cost of production, \$5.

At a transfer price of \$5, Division X would be expected to sell as many units of X8 to Division Y as Division Y would like to buy.

However, although marginal cost represents the opportunity cost to Division X of transferring units of X8, it is not an ideal transfer price.

- At a transfer price of \$5, Division X would make \$0 contribution from each unit transferred. The Division would therefore make a loss of \$40,000 (its fixed costs).
- This transfer price would not motivate the manager of Division X to maximise output.
- It is unlikely that the manager of Division X would be prepared to negotiate this price with Division Y, and a decision to set the transfer price at \$5 would probably have to be made by head office.
- If Division X is set up as a profit centre, a transfer price at marginal cost would not provide a fair way of measuring and assessing the division's performance.

Transfer price = marginal cost plus

If the transfer price is set at marginal cost plus a mark-up for contribution, the manager of Division X would be motivated to maximise output, because this would maximise contribution and profit (or minimise the loss).

As indicated earlier, Division Y would want to buy as much as possible from Division X provided that the transfer price is no higher than \$17, or possibly \$13.

If a transfer price is set at marginal cost plus a mark-up for contribution, the 'ideal' range of prices lies anywhere between \$5 and \$17. The size of the mark-up would be a matter for negotiation. Presumably, the transfer price that is eventually agreed would be either:

- imposed by head office, or
- agreed by negotiation between the divisional managers, with the more powerful or skilful negotiator getting the better deal on the price.

Additional requirement:

Discuss the implications of setting the transfer cost at full cost plus.

Solution

There is an argument that the opportunity cost of transfer, in the absence of an intermediate market, is full cost.

This assumes that, if the selling division decided against making any transfers at all, it would save all costs, both marginal and fixed costs, by shutting down.

In the above example, the full cost for Division X of making component X8 is \$7 (\$5 variable plus \$2 fixed).

At this price, Division X would want to sell as many units as possible to Division Y, and Division Y would buy as many units as it could, subject to the limit on capacity or sales demand.

However, although full cost represents the long-term opportunity cost to Division X of transferring units of X8, it is not an ideal transfer price.

- At a transfer price of \$7, Division X would make \$0 profit from each unit transferred. If output and sales are less than the budget of 20,000, Division X would make a loss due to the under-absorbed fixed overhead. If output and sales are more than the budget of 20,000, Division X would make a profit due to the over-absorbed fixed overhead. The only ways in which Division X could make a profit are therefore:
 - to hope that sales demand exceeds the budgeted volume, and/or
 - reduce its variable costs and fixed cost expenditures.
- It is unlikely that the manager of Division X would be prepared to negotiate this price with Division Y, and a decision to set the transfer price at \$7 would probably have to be made by head office.
- If Division X is set up as a profit centre, a transfer price at full cost would not provide a fair way of measuring and assessing the division's performance.

Finding an optimal transfer price

The approach to finding an optimal (minimum) transfer price for decision-making (i.e. goal congruence) is to follow this general rule:

$$\text{Optimum Transfer Price} = \text{Marginal cost of the selling division} + \text{Opportunity cost of selling division}$$

- The marginal cost of the selling division may also be referred to as the variable cost.
- The opportunity cost of the selling division is usually any lost contribution of the selling division from selling internally.

This rule will also give you the minimum transfer price acceptable to the selling division.

We can apply this general rule to three scenarios:

Scenario 1: A perfect market for the intermediate product

If the intermediate market is perfect, all suppliers to the market are able to sell all of their output at the prevailing market price. There are no restrictions on sales demand at that price, and no individual supplier dominates market supply.

When a selling division has a perfect external market for its output, it is therefore able to:

- sell all of its output on the external market at the market price, and
- provided that it can sell at a price above its marginal cost, the only limitation on profitability from external sales is the output capacity of the division.

Using the general rule, this means that the optimal (minimum) transfer price is:

$$\text{Optimum Transfer Price} = \text{Market Price} \pm \text{Any small adjustments}$$

In the exam the most common adjustment in the exam will arise from situations where the selling division incurs selling costs when selling externally, that won't be incurred when selling internally (for example packaging or shipping costs).

Using the market price is optimal for decision making as neither division is then tempted to buy or sell externally and, in this scenario, it is also fair from a performance management perspective.



Example: Perfect market for the intermediate product

Division A of the Robin Group makes a product A22, which it sells externally and to another division in the Group, Division B. Division B uses product A22 as a component in product B46, which it sells externally. There is a perfect external market for both A22 and B46.

Costs and sales prices are as follows:

	Division A Product A22	Division B Product B46
Variable production cost	\$12 per unit	
Variable selling cost in the external market	\$3 per unit	
Further variable costs		\$15 per unit
Fixed costs	\$200,000	\$300,000
Sales price	\$20 per unit	\$45 per unit

Division A can either sell product A22 externally for \$20 to earn a contribution of \$5 per unit ($\$20 - \$12 - \$3$) or transfer the product internally to Division B to earn a contribution of \$8 per unit ($\$20 - \$12$). The manager of Division A would prefer to sell to Division B because it is cheaper and more profitable. The lowest transfer price that Division A would accept is \$17.

	\$
External selling price	20
External variable selling cost	(3)
Minimum transfer price (= market price)	17

Division B can either buy product A22 from external suppliers at \$20, or buy internally from Division A. If the transfer price exceeds \$20, Division B will prefer to buy externally, in order to minimise its costs and so maximise its profit.

Conclusions

- There is a **range** of ideal transfer prices, between a **minimum acceptable transfer price of \$17** for Division A and a **maximum acceptable transfer price of \$20** for Division B.
- If the transfer price is set between \$17 and \$20, each division would produce and sell up to its capacity. Each division would maximise its profit by making and selling as much as possible, and the total company profit would be maximised. Goal congruence would be achieved.

- In both Divisions A and B, the manager should be motivated to make and sell as much as possible, and to keep costs under control, in order to maximise profit.
- This price would probably be negotiated freely between the managers of Divisions A and B without head office interference, allowing for autonomy of the divisional managers.
- The performance of each profit centre would be measured on a fair basis.
- If company policy is to encourage inter-divisional sales unless there is a good commercial reason for selling or buying externally, the two divisions should trade internally up to the output capacity of the lower-capacity division.

It can be seen that there is a range of prices which will satisfy the general objectives of a transfer pricing system.

Scenario 2: The selling division has spare capacity

A situation might arise where a division has an intermediate market for its output, and also sells internally, but:

- there is a limit to the amount that it can sell externally, and
- it has spare capacity.

In such a situation, the opportunity cost of transferring units internally would be nil, and the ideal transfer price would be based on cost, not the external market price. The opportunity cost of transferring units internally is nil because the selling division can meet external demand in full, and still have excess capacity for making inter-divisional sales.

Using the general rule, this means that the optimal (minimum) transfer price is:

Optimum Transfer Price = Marginal cost of the selling division

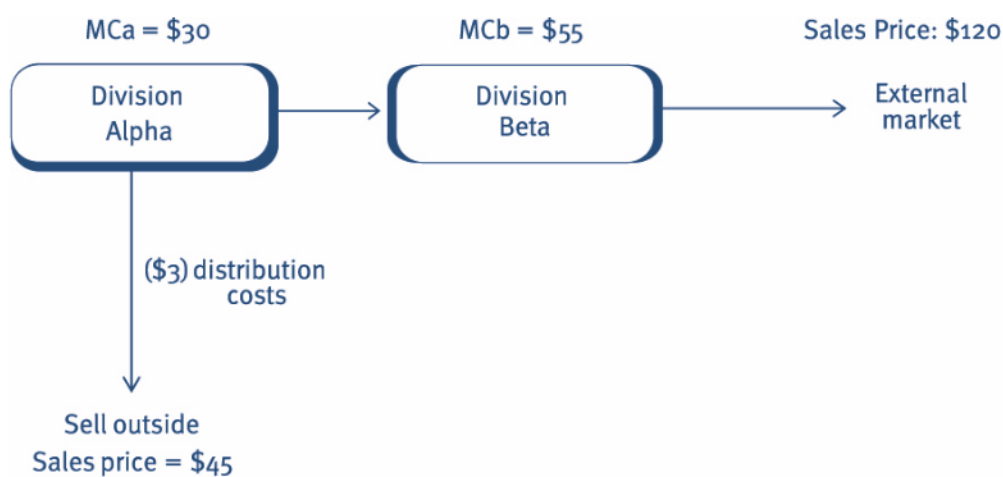
Transferring at the marginal cost ensures optimal decision making as the selling division will be unlikely to purchase the intermediate good elsewhere for less than the marginal cost. However, the problem is that it is unlikely to be 'fair' to the supplying division when appraising the performance of the divisions, as all of the profit from the transferred units will be allocated to the buying division.



Example: Spare capacity

Alameda Ltd has two divisions, Division Alpha and Division Beta. Division Alpha makes widgets, which it can sell externally for \$45 as well as internally to Division Beta. The marginal cost of making a widget is \$30 per unit in Division Alpha, and the division has spare capacity.

Division Beta turns widgets into another product, the bidget, at a marginal cost of \$55 per unit. Division Beta can then sell bidgets externally for \$120 per unit. External sales of widgets incur a variable distribution cost of \$3 per unit:



Required:

What is the optimal transfer price?

Solution:

The optimal transfer price is \$30.

Division A has spare capacity. It is already selling all it can to the external market, and can make extra widgets for B without losing external sales. Therefore, any transfer price must therefore cover A's marginal cost per unit, which is **\$30**.

Scenario 3: The selling division is at full capacity

In this scenario, the selling division can't satisfy the external demand for the intermediary product and therefore any internal sales would mean sacrificing an external sale. As a result, every internal sale results in a lost contribution on the external sale.

Using the general rule this means that the optimal (minimum) transfer price is:

$$\text{Optimum Transfer Price} = \text{Marginal cost of the selling division} + \text{Shadow price (lost contribution)}$$

The shadow price is the opportunity cost of the lost contribution from the other product or it is the extra contribution that would be earned if more of the scarce resource were available.

This transfer price ensures optimal decision making because:

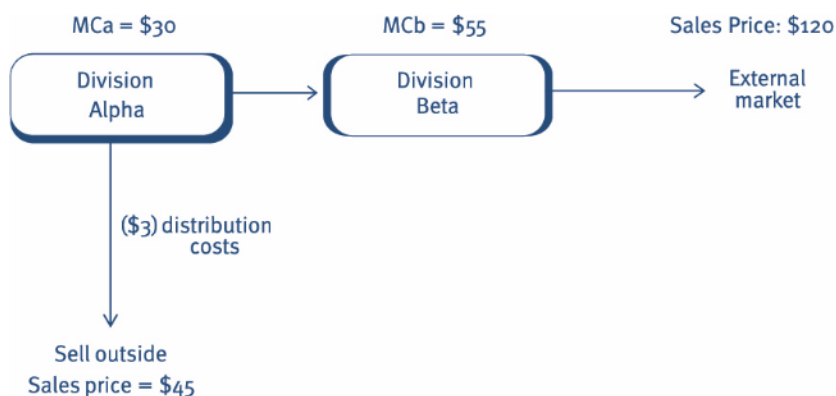
- if the transfer price is less than the maximum price the buying division is willing to pay, then the internal transfer will take place and this will benefit the company as a whole as the total contribution of the company will exceed the lost contribution of the selling division.
- if the transfer price is more than the maximum price that the buying division is willing to pay, then the contribution the selling department gets from selling externally will exceed and benefit from the internal transfer.



Example: Full capacity

Alameda Ltd has two divisions, Division Alpha and Division Beta. Division Alpha makes widgets, which it can sell externally for \$45 as well as internally to Division Beta. The marginal cost of making a widget is \$30 per unit in Division Alpha, and the division has **no** spare capacity.

Division Beta turns widgets into another product, the bidget, at a marginal cost of \$55 per unit. Division Beta can then sell bidgets externally for \$120 per unit. External sales of widgets incur a variable distribution cost of \$3 per unit:



Required:

What is the optimal transfer price?

Solution:

The optimal transfer price will be the lowest transfer price Division A will accept.

Currently, Division A is making a contribution of $(\$45 - \$3 - \$30) = \$12$ per item sold externally. As Division A has no spare capacity. Every unit A has to supply to B causes a loss of this \$12 contribution.

So the optimal transfer price is given by:

$$\begin{aligned}
 \text{Optimal transfer price} &= \text{Marginal cost to A} + \text{lost contribution} \\
 &= \$30 + \$12 \\
 &= \$42
 \end{aligned}$$

The optimal transfer price is therefore \$42.



Test your understanding 7 – Opportunity cost approach

A company operates two divisions, Able and Baker. Able manufactures two products, X and Y. Product X is sold to external customers for \$42 per unit. The only outlet for product Y is Baker.

Baker supplies an external market and can obtain its semi-finished supplies (product Y) from either Able or an external source. Baker currently has the opportunity to purchase product Y from an external supplier for \$38 per unit. The capacity of division Able is measured in units of output, irrespective of whether product X, Y or a combination of both are being manufactured.

The associated product costs are as follows:

	X	Y
	\$	\$
Variable costs per unit	32	35
Fixed overheads per unit	5	5
Total unit costs	37	40

Required:

Using the above information, advise on the determination of an appropriate transfer price for the sale of product Y from division Able to division Baker under the following conditions:

- when division Able has spare capacity and limited external demand for product X
- when division Able is operating at full capacity with unsatisfied external demand for product X.



Test your understanding 8 – Additional example

Manuco company has been offered supplies of special ingredient Z at a transfer price of \$15 per kg by Helpco company, which is part of the same group of companies. Helpco processes and sells special ingredient Z to customers external to the group at \$15 per kg. Helpco bases its transfer price on full cost plus 25% profit mark-up. The full cost has been estimated as 75% variable and 25% fixed. Internal transfers to Manuco would enable \$1.50 per kg of variable packing cost to be avoided.

Required:

Discuss the transfer prices at which Helpco should offer to transfer special ingredient Z to Manuco in order that group profit maximising decisions are taken in each of the following situations:

- (i) Helpco has an external market for all its production of special ingredient Z at a selling price of \$15 per kg.
- (ii) Helpco has production capacity for 9,000 kg of special ingredient Z. An external market is available for 6,000 kgs of material Z.
- (iii) Helpco has production capacity for 3,000 kg of special material Z. An alternative use for some of its spare production capacity exists. This alternative use is equivalent to 2,000 kg of special ingredient Z and would earn a contribution of \$6,000. There is no external demand.

Minimum and Maximum transfer prices

Whilst we have considered a rule to find an optimal minimum transfer price so far, there is actually a range of possible optimal transfer prices that both the buying division and selling division will accept. The range is between the minimum and maximum transfer prices as given by the rules below:

Minimum transfer price:

As discussed above the selling division will only accept a transfer price that doesn't leave them worse off:

$$\text{Minimum Transfer Price} = \text{Marginal cost of the selling division} + \text{Any lost contribution}$$

Maximum transfer price:

The buying division will also only accept a transfer price that won't leave them worse off. This is calculated as follows:

$$\text{Maximum Transfer Price} = \text{The lower of: } \begin{array}{l} \text{The external purchase price (e.g. from an external supplier)} \\ \text{AND} \\ \text{The net marginal revenue of selling on the final product} \end{array}$$

The net marginal revenue is calculated as:

$$\text{Net marginal revenue} = \text{Final sales price} - \text{Additional variable costs}$$



Example: Maximum transfer price

Division B manufactures product X, and sells it to external customers for \$50. In order to manufacture product X, it needs component Y which it can either buy from an external supplier for \$20, or buy it internally from division S. Once it has purchased the component, Division B incurs an additional \$23 in variable costs before the final product is ready to sell.

Required:

What is the maximum transfer price Division B will accept?

Solution:

The maximum price Division B will pay for component Y is **the lower of:**

- The external purchase price of component Y = \$20, and
- The net marginal revenue of selling product X = $\$50 - \$23 = \$27$

So division B will pay a **maximum of \$20**. Any higher than this and they could make more profits from buying the component externally, so would not have any incentive to buy from Division S.



Test your understanding 9 – Transfer pricing

- (1) Frankie co has two divisions, A and B. Division A makes a component at a marginal cost of \$30, which it can only sell to Division B. Division A has no other outlet for sales. Division B takes A's component and turns it into a finished good, incurring its own cost of \$55 per unit and selling it externally at \$120.

Which ONE of the following statements is true?

- A The minimum TP that Division A will accept from Division B is \$ 30, the maximum TP that Division B will pay is \$60 and the company makes a negative contribution.
- B The minimum TP that Division A will accept from B is \$ 30, the maximum TP that B will pay is \$65 and the company makes a negative contribution.
- C The minimum TP that Division A will accept from B is \$ 30, the maximum TP that B will pay is \$65 and the company makes a positive contribution.
- D The minimum TP that Division A will accept from B is \$ 30, the maximum TP that B will pay is \$55 and the company makes a positive contribution.

- (2) Division A has decided it wants to maximise its own profits by selling externally at a price of \$45 to Customer Co, after incurring distribution costs on external sales of \$3 per unit. As before, Division A can also sell internally to Division B.

Which of the following statements are correct?

- (1) The net sales price per unit Division A gets externally is \$42.
 - (2) \$65 is the maximum transfer price B will pay.
 - (3) If working at full capacity, \$42 is the lowest transfer price Division A will accept.
 - (4) If there is spare capacity in Division A, \$30 is the lowest transfer price Division A will accept.
- A Statements (2) and (3) only
 - B Statements (1), (2) and (4) only
 - C Statements (1), (3) and (4) only
 - D Statements (1), (2), (3) and (4)
- (3) Division A operates at full capacity and sells all its components for \$45 to Customer Co, after incurring distribution costs on external sales of \$3 per unit. An external supplier, Third Co, has offered to supply Division B for \$40 per unit.

What should each division do to maximise company profitability?

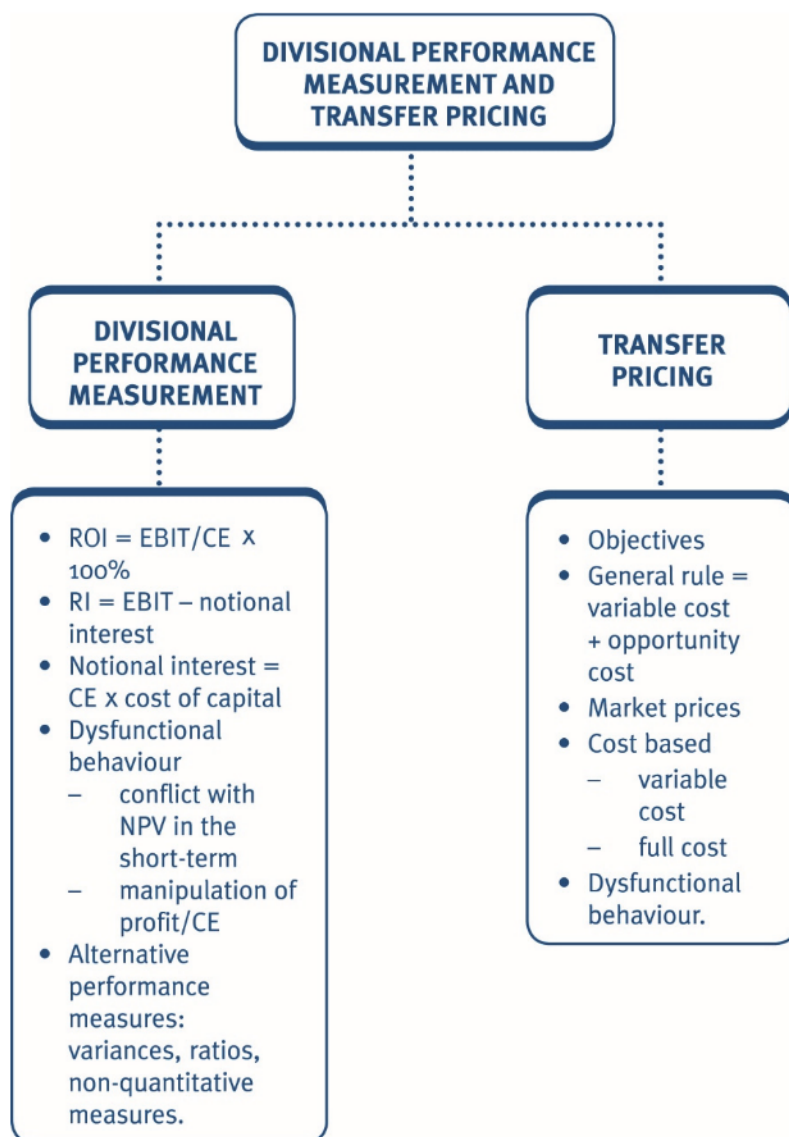
- A Division A should not produce the component for Division B and keep all its units for external sales.
- B Division A should redirect some of its external sales towards Division B and sell to Division B at price between \$30 and \$40.
- C Division A should not produce at all and all supplies to Division B should be externally sourced from Third Co.
- D Division A should try and sell all its components to Division B for \$42.

- (4) Division A operates at full capacity and sells all its components for \$45 to Customer Co, after incurring distribution costs on external sales of \$3 per unit. Third Co, the original external supplier to Division B, has now gone out of business but Fourth Co, another external supplier, has offered to supply Division B for \$29 per unit.

What should Frankie Co do to maximise company profitability?

- A Division A should not produce the component for Division B and keep all its units for external sales.
 - B Division A should redirect some of its external sales towards Division B and sell to Division B at price between \$30 and \$40.
 - C Division A should not produce at all and all supplies should be externally sourced from Fourth Co.
 - D Division A should try and sell all its components to Division B for \$42.
- (5) **Which of the following statements regarding the objectives of a transfer pricing system are correct?**
- (1) A transfer pricing system should encourage output at an organisation-wide profit-maximising level.
 - (2) A transfer pricing system should encourage divisions to make autonomous decisions.
 - (3) A transfer pricing system should encourage dysfunctional decision making.
- A Statement (2) only
 - B Only statements (1) and (3)
 - C Only statements (1) and (2)
 - D All statements

3 Chapter summary



Test your understanding answers



Test your understanding 1 – ROI calculation

- ROI might be measured as: $\$28,000/\$142,000 = 19.7\%$.
- However, suppose that the centre manager has no responsibility for debt collection. In this situation, it could be argued that the centre manager is not responsible for trade receivables, and the centre's CE should be \$112,000. If this assumption is used, ROI would be $\$28,000/\$112,000 = 25.0\%$.



Test your understanding 2 – Disadvantages of ROI

(a)

	Division A	Division B
	\$000	\$000
Old ROI	90/300 = 30%	10/100 = 10%
New ROI	(90 + 20)/(300 + 100) = 27.5%	(10 + 12)/(100 + 100) = 11%
Will manager want to accept project?	No	Yes

The manager of Division A will not want to accept the project as it lowers her ROI from 30% to 27.5%. The manager of Division B will like the new project as it will increase their ROI from 10% to 11%. Although the 11% is bad, it is better than before.

- (b) Looking at the whole situation from the group point of view, we are in the ridiculous position that the group has been offered two projects, both costing \$100,000. One project gives a profit of \$20,000 and the other \$12,000. Left to their own devices then the managers would end up accepting the project giving only \$12,000. This is because ROI is a defective decision-making method and does not guarantee that the correct decision will be made.



Test your understanding 3 – RI calculation

If performance is measured by RI, the RI for the period is:

	\$
Profit before interest and tax	160,000
Notional interest (12% × \$800,000)	(96,000)
RI	64,000

(**Note:** Capital employed is not available in this question and therefore net assets should be used as a substitute value).

Investment centre managers who make investment decisions on the basis of short-term performance will want to undertake any investments that add to RI, i.e. if the RI is positive.



Test your understanding 4 – ROI vs RI

(a) ROI

	Without the investment	With the investment
Profit	\$160,000	\$175,000
Capital employed	\$800,000	\$900,000
ROI	20.0%	19.4%

ROI would be lower; therefore the centre manager will not want to make the investment, since their performance will be judged as having deteriorated. However, this results in dysfunctional behaviour since the company's target is only 12%.

(b) RI

		Without the investment		With the investment
		\$		\$
Profit		160,000		175,000
Notional interest	(\$800,000 × 12%)	(96,000)	(\$900,000 × 12%)	(108,000)
RI		64,000		67,000

The investment centre manager will want to undertake the investment because it will increase RI. This is the correct decision for the company since RI increases by \$3,000 as a result of the investment.



Test your understanding 5

Problems may include:

- Divisions may operate in different environments. A division earning a ROI of 10% when the industry average is 7% may be considered to be performing better than a division earning a ROI of 12% when the industry average is 15%.
- The transfer pricing policy may distort divisional performance.
- Divisions may have assets of different ages. A division earning a high ROI may do so because assets are old and fully depreciated. This may give a poor indication of future potential performance.
- There may be difficulties comparing divisions with different accounting policies (e.g. depreciation).
- Evaluating performance on the basis of a few indicators may lead to manipulation of data. A wider range of indicators may be preferable which include non-financial measures. It may be difficult to find non-financial indicators which can easily be compared if divisions operate in different environments.



Test your understanding 6 – Full cost and marginal cost

(a)

	Division A (\$)	Division B (\$)	Total (\$)
Sales:			
– internal	10,000 × \$17.60 (W1) = 176,000	n/a	176,000
– external	n/a	10,000 × \$35 = 350,000	350,000
Costs:			
– transfer costs	n/a	(176,000) (as above)	(176,000)
– variable costs	10,000 × \$10 = (100,000)	10,000 × \$5 = (50,000)	(150,000)
– fixed costs	(60,000)	(30,000)	(90,000)
Profit	16,000	94,000	110,000

(b)

	Division A (\$)	Division B (\$)	Total (\$)
Sales:			
– internal	10,000 × \$11 (W2) = 110,000	n/a	110,000
– external	n/a	10,000 × \$35 = 350,000	350,000
Costs:			
– transfer costs	n/a	(110,000) (as above)	(110,000)
– variable costs	10,000 × \$10 = (100,000)	10,000 × \$5 = (50,000)	(150,000)
– fixed costs	(60,000)	(30,000)	(90,000)
Profit/(loss)	(50,000)	160,000	110,000

Working 1

	\$
Material cost per unit	8
Other variable costs per unit	2
Fixed cost per unit (\$60,000 ÷ 10,000)	6
Full cost	16
Plus 10% profit	1.60
Transfer price = full cost + 10%	17.60

Working 2

	\$
Material cost per unit	8
Other variable costs per unit	2
Total variable cost	10
Plus 10% profit	1
Transfer price = marginal cost + 10%	11

- (c) – Division A would prefer the transfer price to be set at full cost plus 10%. This would give them a budgeted profit of \$16,000, compared to a loss of \$50,000 when the marginal cost transfer price is used.
- Division B would prefer the transfer price to be set at variable cost + 10%. This gives them a profit of \$160,000 compared with a profit of \$94,000 if the full cost transfer price is used.
- There is a natural conflict between the divisions and the transfer price would have to be negotiated to ensure that each division views it as being fair.
- The company as a whole will be indifferent to the transfer price. There is no external market for Division A's goods and the profit will be \$110,000 regardless of the transfer price set.



Test your understanding 7 – Opportunity cost approach

- (i) The transfer price should be set between \$35 and \$38. Able has spare capacity, therefore the marginal costs to the group of Able making a unit is \$35. If the price is set above \$38, Baker will be encouraged to buy outside the group, decreasing group profit by \$3 per unit.
- (ii) If Able supplies Baker with a unit of Y, it will cost \$35 and they (both Able and the group) will lose \$10 contribution from X (\$42 sales – \$32 variable cost). So long as the bought-in external price of Y to Baker is less than \$45, Baker should buy from that external source. The transfer price should therefore be set at \$45.



Test your understanding 8 – Additional example

- (i) Since Helpco has an external market, which is the opportunity foregone, the relevant transfer price would be the external selling price of \$15 per kg. This will be adjusted to allow for the \$1.50 per kg avoided on internal transfers due to packing costs not required.
- The transfer price offered by Helpco should be $\$15 - \$1.50 = \$13.50$ per kg.
- (ii) In this situation Helpco has no alternative opportunity for 3,000 kg of its special ingredient Z. It should, therefore, offer to transfer this quantity at marginal cost. This is variable cost less packing costs avoided = $\$9 \text{ (W1)} - \$1.50 = \$7.50$ per kg.
- Working 1: Total cost = $\$15 \times 80\% = \$12$, Variable cost = $\$12 \times 75\% = \$9$.
- If Manuco require more than 3,000 kgs the transfer price should be set at the adjusted selling price of \$13.50 per kg as in (i) above.

- (iii) Helpco Co has an alternative use for some of its production capacity, which will yield a contribution equivalent to \$3 per kg of special ingredient Z (\$6,000/2,000 kg). The balance of its square capacity (1,000 kg) has no opportunity cost and should still be offered at marginal cost.

Helpco should offer to transfer:

2,000 kg at $\$7.50 + \$3 = \$10.50$ per kg; 1,000 kg at \$7.50 per kg (= MC).



Test your understanding 9 – Transfer Pricing

- (1) **C**

Contribution = B's sales price – MC_a – MC_b

Contribution = $120 - 30 - 55$

Contribution = 35

The minimum TP that A will accept is $MC_a = \$30$

The maximum TP that B will pay is B's sales price – $MC_b = \$120 - \$55 = \$65$

- (2) **D**

A's net sales price is sales price \$45 – selling costs \$3 = \$42

The maximum transfer price B will pay is B's sales price – $MC_b = \$120 - \$55 = \$65$.

If A is at full capacity, every unit A has to supply to B causes a loss of external net revenue. Therefore, the TP must be at least \$42 to compensate A and the company for its lost net revenue. If A has spare capacity, it is already selling all it can to the outside market and can make extra goods for B without losing external sales. Therefore, any TP must therefore cover $MC_a = \$30$.

- (3) **A**

Division A sells externally for net \$42. Division B buys externally for \$40, and no internal transfers should take place.

- (4) **C**

From a purely financial perspective, Division A should not produce the product as the external supplier can undercut MC_a . All supplies should be externally sourced for \$29 per unit and sold by Frankie Co for a net \$42, or incur MC_b and then be sold for \$120.

- (5) **C**

Performance measurement in not-for-profit organisations and the public sector

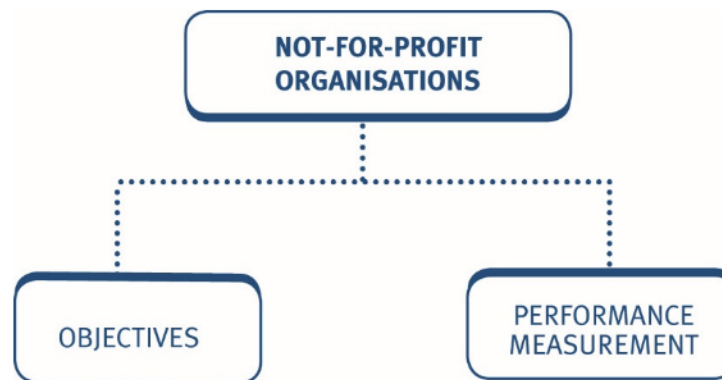
Chapter learning objectives

Upon completion of this chapter you will be able to:

- Comment on the problems of having non-quantifiable objectives in performance management.
- Comment on the problems of having multiple objectives in not-for-profit organisations and the public sector.
- Explain how performance could be measured in not-for-profit organisations and the public sector.
- Explain Value for Money (VFM) as the public sector objective, and how the 3Es can be used to achieve VFM.



One of the PER performance objectives (PO14) is to measure and assess departmental and business performance. Working through this chapter should help you understand how to demonstrate that objective.



1 The problem of non-quantifiable objectives

The not-for-profit (NFP) sector and the public sector incorporate a diverse range of operations, including national government, local government, charities, executive agencies, trusts and so on. The critical thing about such operations is that they are **not** motivated by a desire to maximise profit.

Many, if not all, of the benefits arising from expenditure by these bodies are non-quantifiable (certainly not in monetary terms, e.g. social welfare). The same can be true of costs. So any cost/benefit analysis is necessarily quite judgemental, i.e. social benefits versus social costs as well as financial benefits versus financial costs. The danger is that if benefits cannot be quantified, then they might be ignored.

Another problem is that these organisations often do not generate revenue but simply have a fixed budget for spending within which they have to keep (i.e. a capital rationing problem). Value for money ('VFM') is often quoted as an objective here but it does not get round the problem of measuring 'value'.



Illustration 1 – The problem of non-quantifiable objectives

A hospital might use a cheaper cleaning firm because of difficulties evaluating how well the cleaning is being done. This may create problems in many areas:

- It may indirectly lead to the spread of infection which is costly to eliminate.
- Nursing staff may become demotivated as they are unable to carry out their own work effectively.
- The general public may lose confidence in the quality of the service.



Test your understanding 1

Discuss how a hospital should determine whether to allocate limited surgical resources to expensive organ transplants or to more routine hip/knee joint replacements.

2 Performance measurement in not-for-profit organisations and the public sector

Not-for-profit organisations and the public sector may have some non-quantifiable objectives but that fact does not exempt them from the need to plan and control their activities.



Illustration 2 – Performance measurement in not-for-profit

A university is an example of a non-profit making organisation. The performance of this not-for-profit organisation must be assessed. Measures include:

University overall:

- overall costs compared with budget
- numbers of students
- amount of research funding received
- proportion of successful students (by grade)
- quality of teaching – as measured by student and inspector assessments
- number of publications by staff.

Individual department or faculty:

- cost per student
- cost per examination pass
- staff/student ratios
- students per class
- number of teaching hours per member of staff
- availability of learning resources, e.g. personal computer (PC) per student ratio
- number of library books per student
- average age of library books.



Test your understanding 2

St Alice's Hospice is a charity which collects funds and donations and utilises these in the care of terminally ill patients. The governing body has set the manager three performance objectives for the three months to 30 June 20X7:

- to achieve a level of donations of \$150,000
- to keep administration costs to no more than 8% of donations
- to achieve 80% of respite care requested from the community.

Actual results were as follows:

	April	May	June
Donations(\$)	35,000	65,000	55,000
Administration costs (\$)	2,450	5,850	4,400
Respite care requests (days)	560	570	600
Respite care provided (days)	392	430	510

Prepare a statement to assist the manager in evaluating performance against objectives and comment on performance.

3 The problem of multiple objectives

The primary objective in not-for-profit and public sector organisations is not to make money, but to benefit prescribed groups of people. As with any organisations, NFPs will use a mixture of financial and non-financial objectives.

Multiple stakeholders in not-for-profit organisations give rise to multiple objectives. As a result, there is a need to prioritise objectives or to make compromises between objectives. With NFPs the non-financial objectives are often more important and more complex, because of the following:

- Most key objectives are very difficult to quantify, especially in financial terms e.g. quality of care given to patients in a hospital
- Multiple and conflicting objectives are more common in NFPs, e.g. quality of patient care versus the number of patients treated.



Illustration 3 – The problem of multiple objectives

A hospital will have a number of different groups of stakeholders, each with their own objectives. For example:

- Employees will seek a high level of job satisfaction. They will also aim to achieve a good work-life balance and this may result in a desire to work more regular daytime hours.
- Patients will want to be seen quickly and will demand a high level of care.

There is potential conflict between the objectives of the two stakeholder groups. For example, if hospital staff only work regular daytime hours then patients may have to wait a long time if they come to the hospital outside of these hours and the standard of patient care will fall dramatically at certain times of the day, if most staff only work regular hours.

The hospital must prioritise the needs of the different stakeholder groups. In this case, the standard of patient care would be prioritised above giving staff the regular daytime working hours that they would prefer. However, in order to maintain staff morale an element of compromise should also be used. For example, staff may have to work shifts but may be given generous holidays allowances or other rewards instead.



Test your understanding 3

Describe the different groups of stakeholders in an international famine relief charity. Explain how the charity may have conflicting objectives and the impact this may have on the effective operation of the organisation.

4 Value for money (VFM)

A common method of assessing public sector performance is to assess value for money (VFM). This comprises three elements:



Economy – an input measure. Are the resources used the cheapest possible for the quality required?

Efficiency – here we link inputs with outputs. Is the maximum output being achieved from the resources used?

Effectiveness – an output measure looking at whether objectives are being met.



Illustration 4 – Value for money

Value for money in a university would comprise the three element of:

Economy – this is about balancing the cost with the quality of the resources. Therefore, it will review areas such as the cost of books, computers and teaching compared with the quality of these resources. It recognises that the organisation must consider its expenditure but should not simply aim to minimise costs. e.g. low cost but poor quality teaching or books will hinder student performance and will damage the reputation of the university.

Efficiency – this focuses on the efficient use of any resources acquired. For example:

- How often are the library books that are bought by the university taken out on loan by students?
- What is the utilisation of IT resources?
- What % of their working time do lecturers spend teaching or researching?

Effectiveness – this measures the achievement of the organisation's objectives. For example, the university could have the following two stated objectives:

- Objective 1: to improve student graduation rates
- Objective 2: to provide facilities that support educational programs and enable students to develop profession specific skills.

These two objectives could be measured by:

- The % of students achieving a target grade (objective 1)
- The % of graduates who find full time employment within 6 months of graduating (objective 2).

**Test your understanding 4**

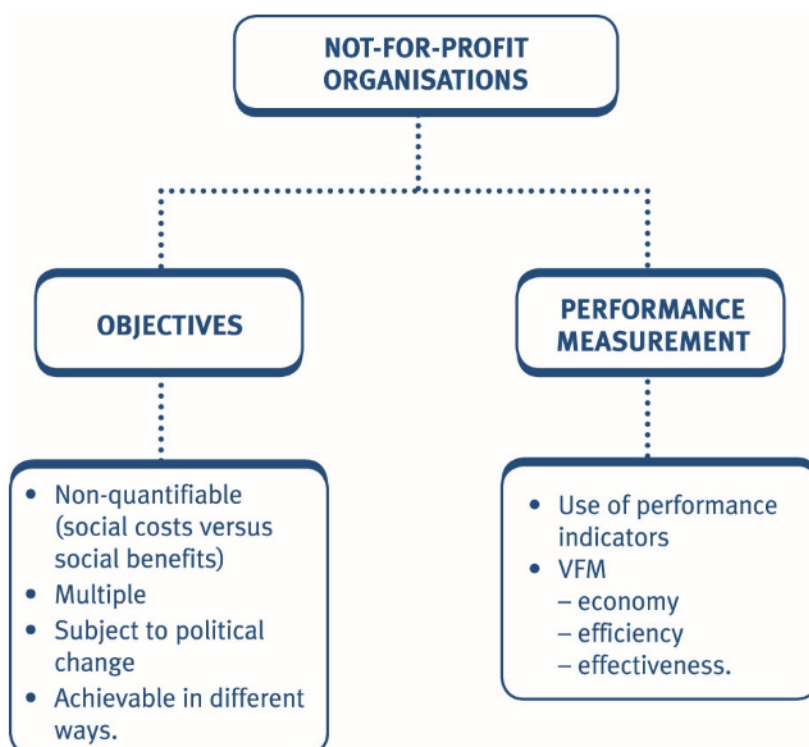
A local authority may have 'maintaining an acceptable quality of life for elderly residents' as one of its objectives. It has several means by which it may achieve this objective, including:

- providing 'meals on wheels' (Social Services Department)
- providing a mobile library (Libraries Department)
- maintaining access to and facilities in local parks (Parks Department)
- providing police support to the elderly at home (Police Department)
- providing nursing homes (Housing Department).

Required:

Explain how the local authority would determine whether the service was effective in providing VFM.

5 Chapter summary



Test your understanding answers



Test your understanding 1

A hospital may have many specific quantifiable objectives such as a minimum waiting time for treatment but may also have non-quantifiable objectives such as improving general healthcare in the area.

The question of deciding priority between different kinds of treatment cannot simply be determined by comparing measurable cost data as there would be many social costs/benefits to consider. By carrying out expensive transplant surgery this may directly benefit relatively few patients but would be life-saving. It might improve knowledge of surgical techniques and life-threatening conditions which could be used to detect and prevent illness in the future. Hip/knee replacements may give mobility to many people who would otherwise be totally reliant on carers.

It may be impossible for a hospital to decide priorities on financial grounds.



Test your understanding 2

	April	May	June
Administration costs as a % of donations	7%	9%	8%
Target	8%	8%	8%
Respite care provided	70%	75.4%	85%

Total donations received have exceeded the target for the period. There is no discernible trend and it is possible that there were special fund-raising activities in May which generated greater income. Administration costs have been within the target of 8% in April and June but exceeded the target in May. More information is needed to establish why this occurred. There has been a steady improvement in the level of respite care provided and in June the target was exceeded.



Test your understanding 3

The stakeholders will include donors, people needing aid, voluntary staff, paid staff, the governments of the countries granting and receiving aid.

There may be conflicting objectives. Donors and people needing aid will want all of the funds to be spent on famine relief. Management staff may require a percentage of the funds to be spent on administration and promotion in order to safeguard the long-term future of the charity.

Donors may have their own views on how donations should be spent which conflict with management staff.

The charity may wish to distribute aid according to perceived need. Governments in receiving countries may have political reasons for distorting information relating to need.

These conflicts may make it difficult to set clear objectives on which all stakeholders agree.



Test your understanding 4

All of these departmental activities contribute to achievement of the objective. The problem is to find the optimum combination of spending for each of the departments.

- Many elderly people continue to live in their own homes, but are just on the threshold of requiring accommodation in a nursing home. A small cutback in spending in one area (e.g. the withdrawal of a mobile library) may push a lot of elderly people over that threshold. There is then an enormous demand for extra spending by the Housing Department. Nursing home accommodation is an expensive last resort in caring for the elderly.
- An occasional visit by a care worker or a police officer may enable many elderly people to stay in their own homes for much longer than would otherwise be the case.

The key to effectiveness is in finding an optimum pattern of spending to achieve a given objective.

Employability and technology skills

Chapter learning objectives

This chapter contains an overview of the employability and technology skills syllabus area. This is relevant for all ACCA Applied Skills (except LW) and Strategic Professional exams.

1 Purpose of chapter

This chapter explains the content included within the employability and technology skills syllabus area. A similar syllabus area is included in all Applied Skills (except LW) and Strategic Professional level syllabi.

ACCA exams utilise software and technology similar to those used in the modern workplace. By studying ACCA exams, candidates will be equipped with both technical syllabus knowledge and practical, applied software skills. The employability and technology skills syllabus area is included within the syllabus to acknowledge this acquired skillset.

2 Content of the employability and technology skills syllabus area

The employability and technology skills syllabus area is outlined in the syllabus and study guide. It consists of the following:

- (1) Use computer technology to efficiently access and manipulate relevant information.
- (2) Work on relevant response options, using available functions and technology, as would be required in the workplace.
- (3) Navigate windows and computer screens to create and amend responses to exam requirements, using the appropriate tools.
- (4) Present data and information effectively, using the appropriate tools.

By using a computer-based examination (CBE), the ACCA has enabled the use of word processing, spreadsheet, screen navigation and data processing functionalities to become part of their assessment range. This replicates the skills used in the modern workplace, whether in accounting practice, in industry or outside of accountancy altogether.

Whilst sitting an exam, candidates will be using the functionality of the CBE software in a variety of ways e.g. to prioritise information within the question data provided, to organise and present their answers in a manageable fashion, to use shortcuts and software functionality to increase efficiency. Skills garnered in the workplace can be used in the examination and vice versa.

This reflects that exams offered at Applied Skills and Strategic Professional are designed to be relevant and accessible to all students. The delivery mode and assessment types require students to demonstrate similar skills to those required in the modern workplace. Offering computer-based exams (CBE) at all levels gives students the opportunity to focus on the application of knowledge to scenarios, using a range of tools – spreadsheets, word processing and presentations. This not only allows students to demonstrate their technical and professional skills, but also their use of the technology relevant to the modern workplace. CBEs, therefore, offers the candidate an examination delivery method that allows them to demonstrate their knowledge and skills with the technology they are most familiar with, in the classroom or at work.

3 CBE support and the ACCA Exam Practice Platform

ACCA candidates can access the ACCA's Exam Practice Platform to practice attempting questions using the CBE software. It is imperative that candidates are familiar with the software before attempting the exam.

The link to the PM Exam Practice Platform access gateway can be found here:

<https://bit.ly/2VOZo3M>

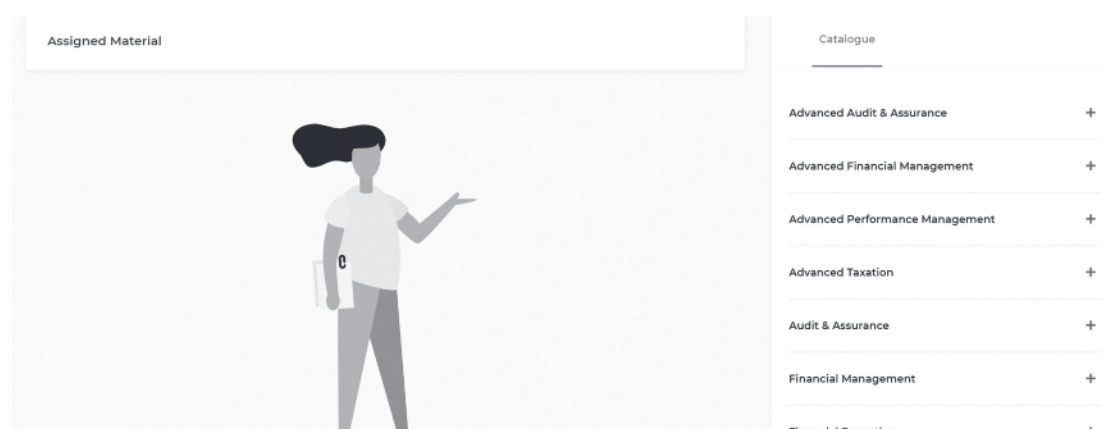
This requires a MyACCA login to access the platform.

Support, access to other papers, tutorial videos and CBE advice can be found here:

<https://bit.ly/2IIBV6Y>

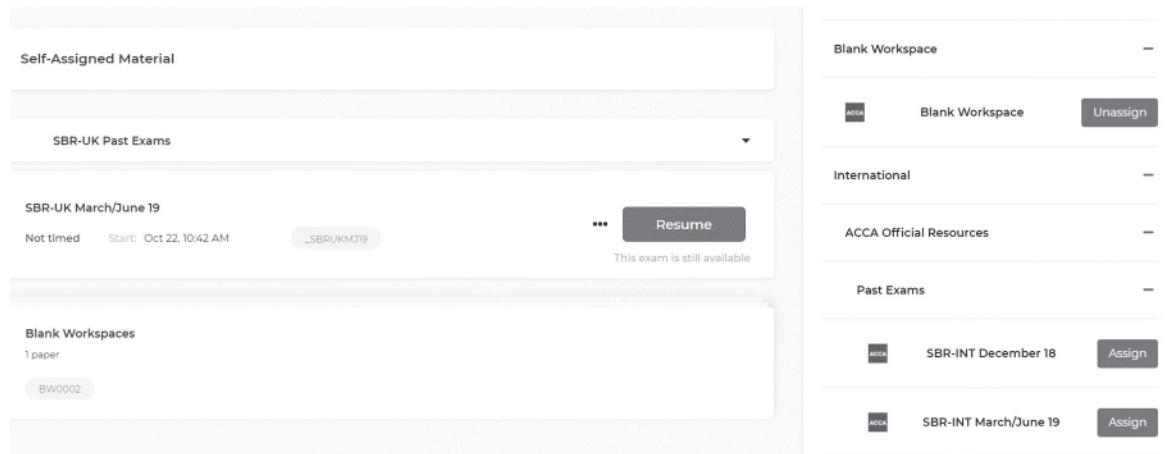
4 Contents of the CBE and Exam Practice Platform

On entering the Exam Practice Platform, candidates will access their dashboard, as follows:



Candidates should click their appropriate exam in the right hand side menu. There they will be able to 'assign' content to their workspace. Candidates can assign a blank workspace or ACCA official resources (which include past examinations presented using the CBE software for the candidates to attempt) to their workspace.

This will be added to the candidate's 'Self-Assigned Material' listing as below:



When working within the assignment the candidate will use response options to provide their answer.

The **Response Options** are where the candidate will attempt their answers.

There are up to three types of response option provided, dependent upon the specific syllabus a candidate is studying. Not every option will appear in each exam. Check the exam practice platform for examples of the responses that are commonplace within your exam.

The response options are:

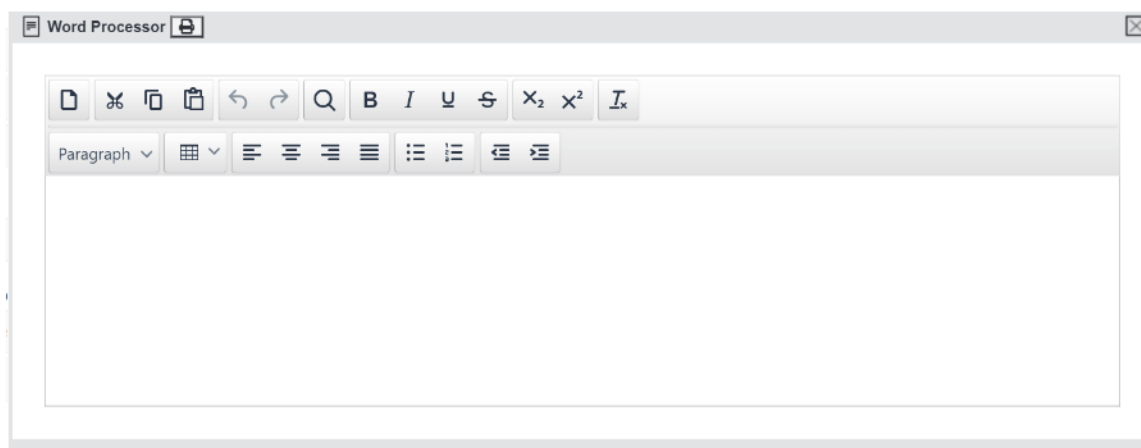
- the word processor,
- the spreadsheet, and
- the slides.

The candidate must determine which of the response options is the most suitable for their specific answer.

These replicate the functionality of widely used software packages. The ACCA has developed this software, for use during home question practice and under exam conditions, to replicate the practical skill sets and work-based behaviours adopted by various industries throughout the world. By studying the ACCA qualification, candidates will improve, not only on their technical knowledge and understanding, but also on skills applied on a daily basis within their work environments. Candidates should practise questions using the CBE platform to ensure they are familiar with the various functions available within their specific examination.

Word Processor

The word processor response option, when relevant, will appear as follows:



This resource has the following advantages and disadvantages:

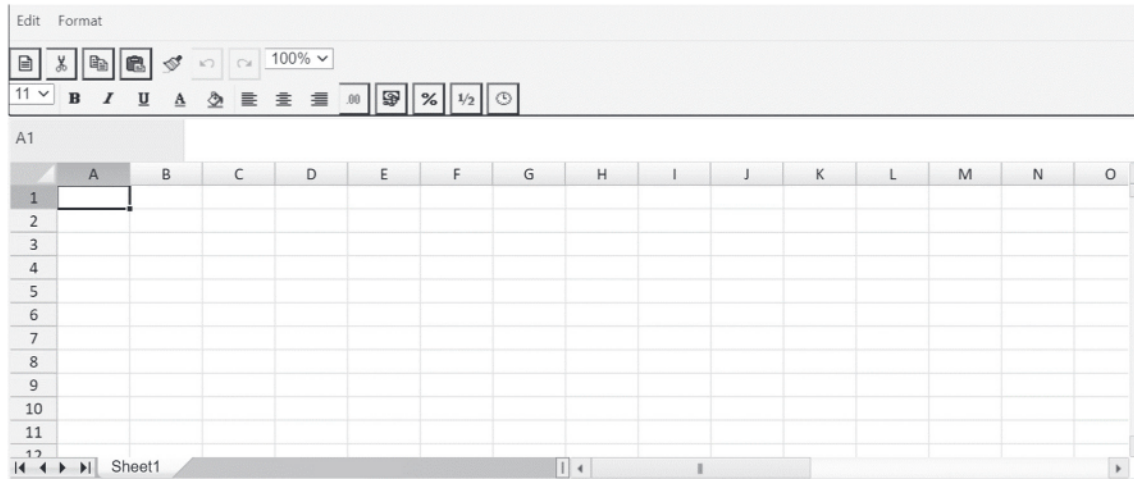
Advantages	Disadvantages
It is easier to continue typing without entering new cells or becoming concerned about cell width	It cannot automatically perform calculations
Answers can be more easily split into paragraphs to make them more visually appealing and easier to mark	Numerical tables can be difficult to label and align
Bullet points can be used to present lists	
Text can be easily aligned and justified	
Superscript and subscript can be easily added to express terms such as 4^2 , for example	

It is, therefore, best suited to discursive answers where candidates are asked, for example, to discuss, analyse or evaluate issues from a scenario or calculation.

The word processing software application could be used in the workplace within the writing of meeting agendas, meeting minutes, external letters, marketing output, briefings, audit reports, textbooks and instructional documentation.

Spreadsheet

The spreadsheet response option, when relevant, will appear as follows:



The spreadsheet software uses the same functionality as other commonly used spreadsheet software. Basic formulae functionality, such as SUM, power functions (e.g. SQRT) and the use of brackets are all reproduced within the ACCA software. Candidates are advised to practise questions using the software so that they are familiar with the functions available and how they can be utilised to the candidate's advantage through improved efficiency.

This resource has the following advantages and disadvantages:

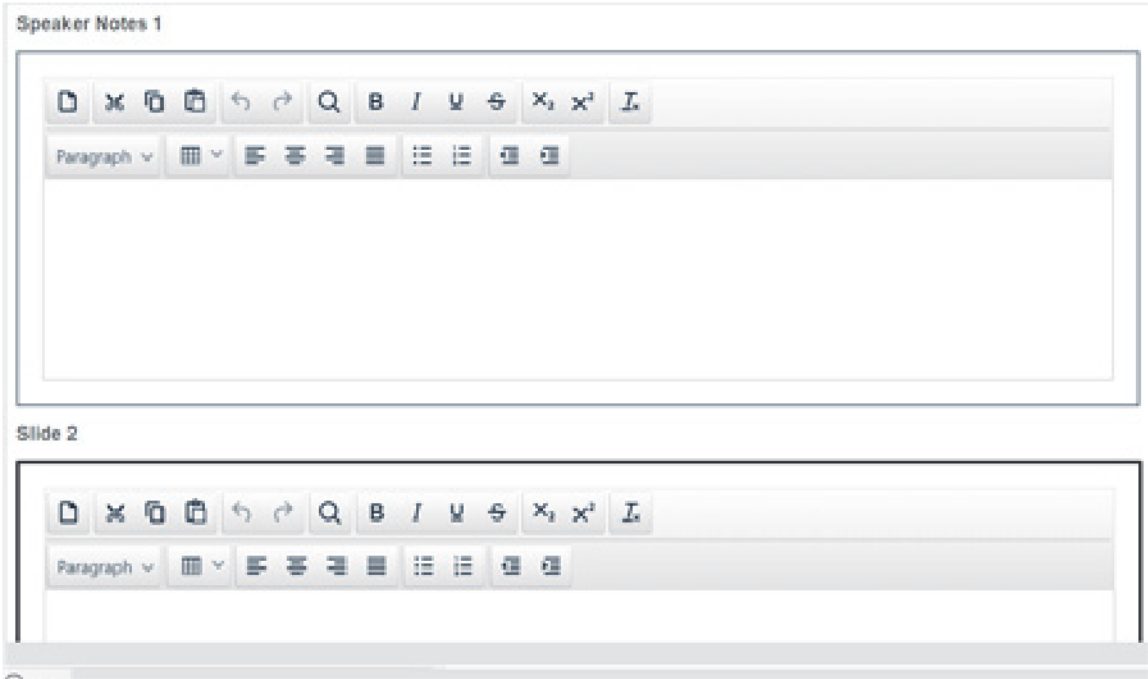
Advantages	Disadvantages
This can quickly and easily perform calculations (e.g. using sums for totals or formulae for calculations)	Text will carry over beyond one cell and may go across and beyond the page width making answers difficult to follow (and mark)
Data within tables can be easily aligned	Bullet points are difficult to use
Shortcut icons can be used to quickly round figures, change numbers to percentages etc.	
Tables can easily and quickly be copied when calculations need to be reformed (e.g. for sensitivity analysis, tax calculations for more than one person, financial statements for more than one company etc.)	
Column width can be adjusted to label length	

It is, therefore, best suited for performing calculations within the examination e.g. NPVs, tax computations, goodwill calculations.

Spreadsheet software is ubiquitous in the modern workplace. It has the capacity to record, store and organise huge swathes of data and information relating to all aspects of a business. Examples of only a few of its possible practical applications include the preparation of management and financial accounts, operational controls and record-keeping e.g. expense claims, data analytics, project appraisals, sample size selection and tax computations.

Slides

The slides response option, when relevant, will appear as follows:



This resource has the following advantages and disadvantages:

Advantages	Disadvantages
Key messages are easier to see	There is limited space and ability to contain detail outside of the speaker notes
Tables can be easily added	It cannot automatically perform calculations
Speaker notes can be added for the detail	
Bullet points can be used to provide lists	
Titles can be given more prominence	

This is best suited for requirements that ask for presentations. This is not a common response option and is not applicable to most ACCA exams. Expect to see it within SBL.

The simple, aesthetically pleasing visual information provided by slide software is effectively used in the workplace when material is required to be shared with a wider audience. Slide software will be used during sales pitches, job interviews, presentations, keynote speeches and product launches.

5 Chapter summary

The CBE software will replicate the work that is performed by accountants in a typical workplace. It will be used across the syllabus to support a candidate's answer by providing suitable response options for different types of answers.

These response options will be most suitable in the following instances (when available):

- For discursive answers: it is best to use the word processing option
- For calculations: it is best to use the spreadsheet option
- For presentations: it is best to use the slides option.

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